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MINOR UROLOGIC PROCEDURES OF VALUE TO THE GENERAL PRACTITIONER

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THE old adage "Trifles make perfection, but perfection is no trifle" is probably the real inspiration for this effort to bring to your attention some of the small things we have learned through the years. We have grown to depend on them and have graded them rather high in the scale of real values. We hope you will pardon us for bringing you down from the rarefied atmosphere of medical and surgical erudition to the "cornbread and pot-likker" level of little things.

A Narrow Urethral Meatus (fig. 1) is truly a small thing and yet it may be of tremendous importance. It may act as a constant and definite obstruction to the passage of urine, resulting in bladder retention, hydroureter and hydronephrosis; and, once such a damaged urinary tract is infected, it may lead to a perpetuation of infections from the prostate gland on up to the dilated kidney pelvis. It may also be the direct means of perpetuating acute and chronic urethral infections, either gonorrheal or non-gonorrheal. In the acute stage of urethritis this narrowed opening impedes the drainage of the urethral canal and hence helps defeat you in your therapeutic efforts. It is frequently the cause for the recurrence of many chronic specific and non-specific infections of the urethra. Many a man has carried for years a chronic urethritis with its oft-recurring exacerbations simply because a narrow meatus has kept a bulbous bougie out of the urethra which would have detected strictures of the urethra of large caliber. We know of no greater aid in clearing

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up these chronic recurring cases than a *properly done meatotomy and the proper exploration of the urethra with bulbs and sounds.*

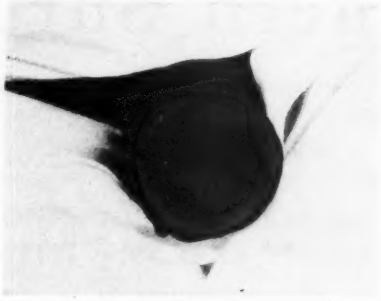

Fig. 1. Narrow urethral meatus.

A meatotomy clamp properly applied to the lower margin of the meatus and left in place a few minutes makes the incision almost bloodless. This of course should be preceded by a small amount of procaine hydrochloride infiltrated into the area to be clamped. Be sure to make the meatus a 32 F, nothing less will fulfill the requirements for the simple reason that often strictures of 26-28 and even 30 F caliber are the cause of the man's trouble and unless you get the meatus well open these larger caliber strictures will be missed. One caution should be added; viz., have the patient return every day for the passage of the 32 F bulb through the meatus for at least seven to ten days to prevent recontraction of the meatus.

Acute Epididymitis, like the poor, we have with us always, and as a rule it is as poorly treated. The usual treatment is an adhesive plaster shelf across the bases of the thighs for the swollen, tender, painful mass to roll on ceaselessly to the constant discomfort of the patient. There is usually added some foul smelling, greasy mess applied to the offending member which can have no possible therapeutic effect. As a rule not even the hair is shaved and this constant hair pulling, together with the freely swinging, inflamed scrotum, perfuming the air with an odor of rotten fish, combine to make the poor fellow's last state worse than his first.

We handle these cases of acute epididymitis by applying a snug-fitting adhesive plaster suspensory. First shave the entire suprapubic and scrotal hair, well down into the perineum. Then, with the scrotum well held up, the first piece of two inch adhesive plaster, sixteen or eighteen inches long is applied as shown in fig. 2. Be sure that the middle of the piece is stuck well down in the perineum; each end is then brought up over the groin and on to the lower abdomen.

The second piece of the same length is similarly applied letting it overlap the first piece about three-fourths to one inch.

Now with the smaller strips of the same width tape completely cover over the entire scrotum up to the base of the penis, using a little tension to pull the two long strips close together, for in this way we produce a gentle concentric pressure, which of itself is helpful. One horizontal strip just above the base of the penis extending across both long strips completes your suspensory.

By this support the scrotum is as nearly immobilized as possible, a thing which immediately adds to the patient's comfort.

In bed for twenty-four hours with an ice bag on one hour and off one hour completes our manner of handling these cases. It is our firm conviction that such a bandage together with the twenty-four to forty-eight hours of bed rest and ice will arrest practically all such cases.

The Full Hot Bath as a urologic procedure is one that we can recommend most heartily for your serious consideration. We use it very extensively for all renal and bladder pains. To be most effective it should be given with the patient immersed to his neck in the water. The water should be as hot as the patient can comfortably tolerate. It should be continued for at least 30 to 45 minutes or an hour.

Too often a hot bath is prescribed casually; this usually means ten to fifteen minutes sitting in the tub with water around the waist. But when given as detailed above we have seen the hot bath relieve patients who have had numerous hypodermics of various drugs with no relief.

One of us (Folsom) called to a nearby city in consultation found the patient's family and physicians almost exhausted because of several days' siege of renal colic due to a small stone in the lower ureter. Nothing had given the patient any material comfort. Much to the dismay and, we may say, disgust of the family and physicians, instead of cystoscoping the patient, we asked to have him put in a hot tub of water as outlined above. In about twenty-five minutes, the patient was easy and wanted to know if he could go to sleep in the tub. When told he could, he slept for one hour in the tub, having his first real comfort in five days.

The patient's wife was told that his passing this small stone was just like having a baby and that she should sit by his bed, tell him to be patient and bear down as long as he could and then put him in the hot water again.

Next morning we received a wire which read, "Baby born at ten-thirty a. m. Thanks for your visit, and a million thanks for your hot water."

The matter of *keeping a urethral catheter properly placed* in the bladder may be a very trying thing, for they do have a very fiendish way of coming out in the middle of the night.

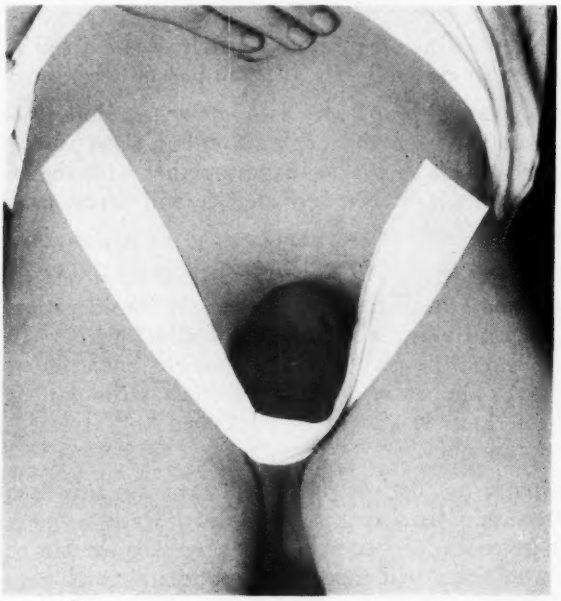

Fig. 2. A. Bandaging the scrotum for epididymitis. After the parts have been shaved, the scrotum is held up and a 2-inch strip of adhesive is applied, its mid part having been stuck well down in the perineum.

The catheter with a small balloon on its inner end will solve this problem for you in a most satisfactory way. After the catheter is passed into the bladder the small bag is distended by injecting 10 to 15 c.c. of sterile water and clamping the outlet to the bag. The distended bag may then be pulled gently down to the neck of the bladder where you feel a hang. It will stay here, properly placed, unless the water is allowed to get out of the bag.

While we are on the subject of catheters we should like to call your attention to the medium or small size soft rubber catheter with the single Coude curve tapered tip. This will frequently be of untold help to you in catheterizing difficult prostatic cases. Since it is soft it is not possible to injure the urethra.

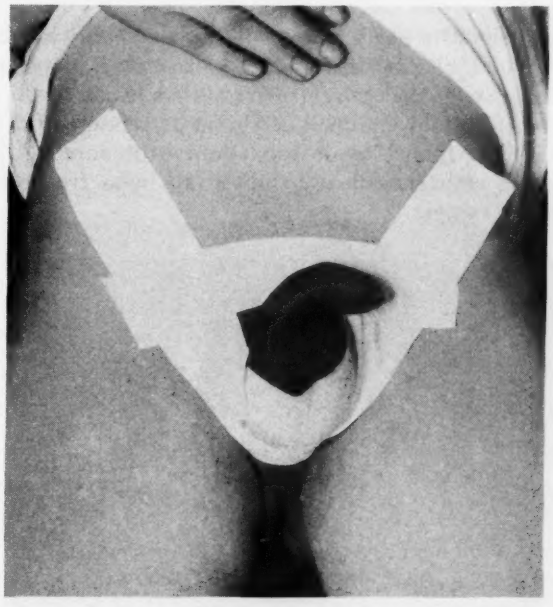

Fig. 2. B. Bandaging the scrotum for epididymitis. A second strip of adhesive is applied overlapping the first by ¼ inch. A third strip is placed suprapubically across the first two.

Fig. 2. C. Bandaging the scrotum for epididymitis. Shorter strips of the same width are placed across the scrotum to the root of the penis so as to pull the long strips together and exert a gentle concentric pressure.

In any patient who has any kind of *urologic history* either renal colic, pain in loin, bladder disturbance of any kind, bloody or pussy urine, *a plain film* of the entire urinary system is one of the simplest things that can be done, and will in a good percentage of cases make a diagnosis. The failure to do this minor procedure has been the cause of much embarrassment to physicians who frequently come along with the patient.

Fig. 3. Kidney stones. This patient had been treated several years for "bladder trouble" before an x-ray was made.

It is important to be sure that the film covers the region of the kidneys, ureters, bladder and prostate; for stones may be found in any one of those locations. Fig. 3 is such a picture, made of a woman who had been treated for several years for "bladder trouble," but no one had ever made such an x-ray. This diagnosis could have been made by any one of you had you done this simple thing.

The failure to make this *plain film* before doing an intravenous urogram may also be extremely embarrassing. Just this had been done in a recent case that came to us, a rather good concentration

of the medium in the left kidney led to a diagnosis of first degree hydronephrosis; but when we saw the patient and made a *plain film* the diagnosis of calculus was at once apparent. This failure has lead to the overlooking of a calculus in the lower end of the ureter, because the medium in the distended bladder obscured the stone.

Fig. 4. Kidney stone. This woman had been treated by two specialists for dyspepsia and nervousness.

A plain film should always be done also in any case of long standing gastric disturbance of that vague, indefinite dyspeptic type that does not fit any of the well known gastric or duodenal lesions. Because not infrequently you will uncover a quiescent renal calculus which is causing all of the patient's gastric disturbance. Figure 4 is that of a woman seen recently who had been studied by a good gastro-enterologist and again by a competent internist seeking the cause of a vague gastric dyspepsia and nervousness. The barium which those two specialists had given before any plates were made had covered up the stone and allowed it to go unrecognized.

The very close relationship existing between renal calculus, particularly, or other renal disease, and those cases of vague, irregular

types of dysepsia has been overlooked. These patients frequently have no symptoms referable to the urinary tract and for that reason they go unrecognized for long periods of time. Such cases are not rare. The removal of the stones frequently relieves all the gastric disturbance.

In our cases of *suspected prostatic enlargement* the one thing upon which we depend for our diagnosis in at least 90 per cent of cases is a simple *air cystogram.*

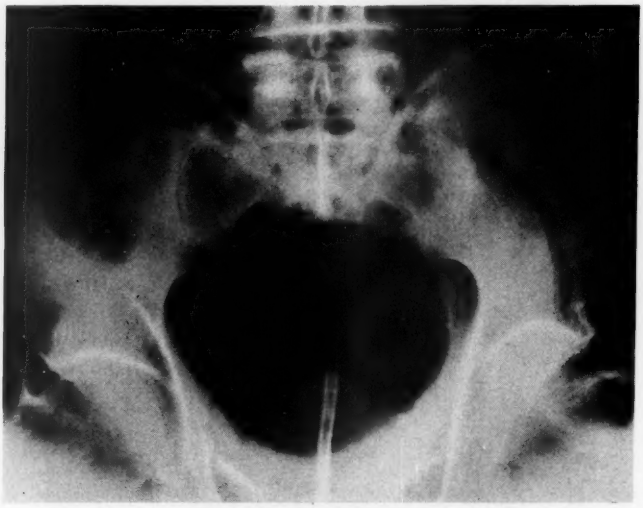

Fig. 5. Air cystogram showing enlargement of the prostate.

You do not need a cystoscope to make an accurate diagnosis in the majority of prostatic enlargements, in fact, it will frequently cause bad reactions in these seriously ill old men and should, in our judgment, never be used until you have found you cannot make a diagnosis by means of the air cystogram.

We feel that the danger of the much discussed, but seldom if ever seen, *air embolus* has, like the report of Mark Twain's death, been greatly exaggerated. We have been using it routinely for many years and have never seen the slightest suggestion of such an occurrence.

The *air cystogram* can be made by any one and requires only a soft rubber catheter, a large bulb syringe and an x-ray machine. After emptying and measuring the residual urine, inject air into the bladder slowly with the large syringe, asking the patient to tell

you as soon as he feels that his bladder is getting full. Then clamp the end of the catheter and make a plain film of the bladder area.

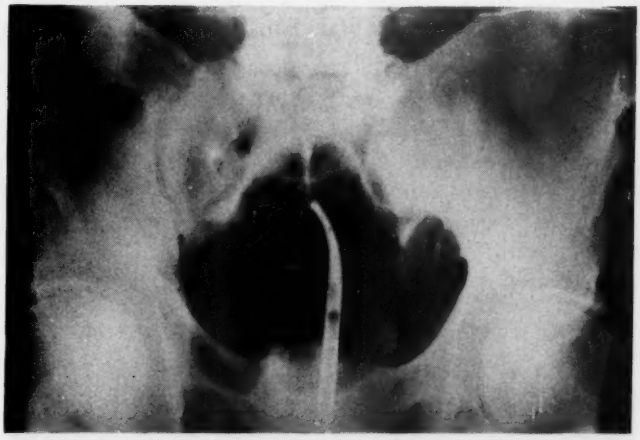

Fig. 6. Air cystogram. Note the two large diverticula.

This *air cystogram* will make a definite, positive picture diagnosis of prostatic hypertrophy in at least 90 per cent of cases, rendering it unnecessary for any one to cystoscope them at all.

Fig. 7. Tumor of the bladder demonstrated by air cystogram.

Figure 5 shows the outline of the prostatic mass protruding into the bladder from the floor. The size may be fairly accurately estimated after you become accustomed to interpreting these shadows.

This simple procedure of the air cystogram will also demonstrate diverticula of the bladder as shown in fig. 6. And, in many cases

will allow you to diagnose tumors of the bladder with remarkable accuracy as shown in fig. 7. In addition, the air in the bladder will so accentuate a stone shadow (fig. 8) that one can scarcely overlook them even though, on the plain film, there may be some question as to the existence of the stone.

Intravenous or Excretory Urography has been so popularized in recent years that it is very widely used by the general practitioner and general surgeon. It has been one of the major chemical achievements of recent years and is a most spectacular procedure. However, the great majority of intravenous urograms are just good enough to be tantalizing, or just poor enough to be worthless so far as any really accurate diagnosis is concerned.

Fig. 8. Stone in the bladder accentuated by air cystogram.

Various mechanical aids have been used, such as the inflated bag pressed down low over the symphysis, to produce pressure on the ureters and so improve the pyelograms but, if they have helped any, it is so slight as to be negligible.

In recent months we have been using the pear-shaped bag of Foley, which we ordinarily use in controlling the bleeding following prostatic resection. Following the intravenous injection of the medium we insert this bag into the rectum, pushing it just above the internal sphincter. The bag is then distended with 150 c.c. of air by means of a 50 c.c. Luer syringe. The inlet is then clamped and the bag pulled snugly down against the rectal sphincter, usually leaving the metal clamp hanging to the catheter.

The pictures are then made just as you would otherwise.

We have found that we get decidedly better filling of the pelvis, calices, and ureters.

The pressure of the distended bag in the rectum presses upward against the lower end of the ureters and gives enough blocking to result in a much improved pyelo-ureterogram.

Fig. 9. Intravenous pyelogram. A Foley bag has been placed in the rectum and inflated. The right kidney in this plate is functionless.

The Hot Box or Hot Seat has been used in one of our offices (Folsom) for over twenty years, and has at times proven to be worth its weight in gold. It is a box about two feet cube with a toilet seat on top and two batteries of light bulbs arranged inside. The exposed perineum, as the patient sits for fifteen to twenty minutes on the seat, is heated and, as a result of this heat, a very soothing effect is produced in many irritable conditions in the perineum and pelvis, both male and female. Of course we use it chiefly for bladder irritation or pain in the bladder or urethra. At times following dilatations with sounds, irrigations with silver nitrate, or endoscopic applications, or fulgurations, the patient feels much like the dog who had had turpentine applied to his south end as he was headed north. This box to those people is an oasis in a

desert they will long remember. It is equally applicable in gynecology and proctology.

Bimanual Examination of the female pelvis is such a routine thing that to fail to make such an examination is one of the grosser sins. But few physicians ever think of making a bimanual examination on a man, and yet after many years of its routine use we can recommend it to you very highly.

First of all, it allows you to make a really much more accurate estimate of the size of the big prostates.

Second, it will often reveal a large stone which may be felt much more accurately than some tubal or ovarian things.

Third, it will not only allow you many times to make a diagnosis of tumor of the bladder but will reveal to you the fact that it is an infiltrating carcinoma.

Only last week, a man, 49 years of age, from a distant state came to us with a letter stating that a papillary tumor had been resected in April, 1940, and radium applied. In June, 1940, a slight recurrence was fulgurated and some x-ray given. In October, 1940, he was seen again, at which time they reported a mild inflammatory reaction. But when we did a bimanual examination we knew at once that he had a serious infiltrating carcinoma of the bladder. One could feel the indurated mass in the left side of the bladder, much as one does a uterus. One did not need a cystoscope to make this diagnosis; in fact, had we relied on the cystoscopic picture we would have been terribly fooled as were his former advisors, for the very good reason that this type of carcinoma of the bladder may present a rather small lesion through the cystoscope, but when one exposes the bladder at operation one finds a growth three or four times as large as he had estimated it. But if a bimanual is done this extravesical induration is very easily detected.

Dilation of the Female Urethra with ordinary male sound is such a little thing to do and yet such a valuable procedure we are compelled to discuss it here in spite of the numerous times we have written and talked on the treatment of this part of the female urinary apparatus. We feel sure that at least 90 per cent of the cases of bladder irritation in women is due to a chronic inflammatory process in the posterior part of the urethra. Some have organic strictures, but by far the majority do not.

It is certainly not very scientific to advise such a blind procedure without a more accurate diagnosis. But every one of you has from one to a dozen women for whom you are now blindly prescribing

saw palmetto, bucu, juniper, potassium acetate, etc., etc., for the relief of bladder irritations. Some of you are equally as blindly washing out their bladders with solutions of every color of the rainbow, from the Stygian blackness of argyrol to the passionate light orchid of weak potassium permanganate solution. So, we are not advising any radical departure, we are simply saying to you that, if you are unable to have these cases properly worked out urologically, the soundest thing you can do for these women is not give them some prescription, and not wash out their much abused, yet innocent bladders, but rather *dilate their urethras*. Unless the urethra is definitely strictured, begin with 24-26-28 F sounds at one sitting, repeat this every four days or twice a week. Increase the size sounds as you progress until you have reached a 32 F, for this is the normal caliber of the female urethra.

This simple procedure will do far more for these sufferers than all the irrigations and cornsilk in the world. And, as a by-product of this dilatation you will frequently be surprised to find that you have also relieved her of a backache she has had for years, or a pain in the iliac region for which you removed her tube and ovary or suspended her uterus with no result.

CARCINOMA OF THE RECTUM, RECTOSIGMOID AND SIGMOID: SELECTION OF CASES FOR ONE-STAGE COMBINED ABDOMINOPERINEAL RESECTION

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MANY operative procedures have been devised for the treatment of carcinoma situated in the rectum, rectosigmoid or lower part of the sigmoid. The surgeon who is called on to treat such conditions should be acquainted with a number of these procedures because no one operation is applicable in all cases. If extensive radical operations only are employed and the mortality rate is kept within reasonable bounds, many patients will be deprived of the benefits that might be derived from more conservative measures. If, on the other hand, through fear of the risks involved in formidable operations, conservative procedures only are advised, many patients will be deprived of their best or only chance for cure. For each patient with carcinoma of the rectum, rectosigmoid or sigmoid, there is a course of action which is best suited to his particular need. One of us (Mayo)[10] recently analyzed a representative group of 100 such cases. In 15 per cent, no operation was performed, either because the condition was felt to be beyond surgical aid or because the patient left without treatment. Irradiation or fulguration or both were carried out in 14 per cent. In 18 per cent, colostomy or exploration only was performed. In 53 per cent (74 per cent of the cases in which operation was performed) resection was carried out.

It is beyond the scope of this paper to consider the relative advantages and disadvantages of the various methods by which resection may be accomplished. Suffice it to say that we agree with Gabriel that "among the great variety of operations possible, the operation of choice should be the most radical one that can be performed with reasonable safety." That radical operations should be reserved for advanced conditions is a common misconception. The truth of the matter is that the greatest hope lies in the application of radical operations in early cases. It is our opinion that the one-stage combined abdominoperineal resection offers many patients suffering from carcinoma of the rectum, rectosigmoid or lower portion of the sigmoid their best prospect of cure. The technic and results of this operation have been reported elsewhere[9]. If it is to

be performed with any degree of safety, care must be exercised in the selection of cases for its use and, at the same time, its benefits should be extended to as many as possible. When, then, is the one-stage combined abdominoperineal resection to be performed? What factors determine whether this operation is suitable in a given case?

When Miles[12] first described the operation in 1907, he felt that it was applicable to less than a third of the cases he saw. He excluded not only patients who had visceral metastasis but also the aged, the obese, the debilitated, those suffering from other diseases and those in whom fixation of the growth had occurred. As surgeons have become more dexterous in performing this operation and as more has been learned about preoperative and postoperative care, the range of its use has been increased widely. On the service of one of us (Mayo), it is performed in 60 per cent of the cases in which resection is carried out. Rankin has performed it in about three-fourths of his cases in which resection has been carried out; Jones[7] has used it even more frequently. At the same time, the mortality rate has fallen from 25 per cent to about 10 per cent.

In an effort to analyze the criteria for selecting cases for this operation, we have reviewed the records of 163 consecutive cases in which it had been performed.

Criteria of Clinical Selection

General considerations. 1. *Age.*—The patients in our group ranged between the ages of 25 and 75 years; the average age was 52.1 years. Age in itself need not be an influencing factor. Naturally, in older patients, the cardiovascular status and renal function must receive particularly careful scrutiny. Age, however, is more important from the standpoint of prognosis than of selection; the tendency toward rapid growth and spread of malignant lesions is greater in youth than in senescence.

2. *Sex.*—There were ninety-nine men and sixty-four women in the group. The more ample pelvis of women tends to make the operation a little easier in members of this sex. Moreover, the rectum is more mobile in women and its separation from the uterus and vagina is simpler and less hazardous than it is from the bladder, prostate gland, seminal vesicles and ureters of men. However, the preponderance of malignant disease in men makes it necessary to perform the operation on men more often than on women, regardless of relative ease and safety.

3. *Habitus and state of nutrition.*—The physical type of the patient is important from a technical standpoint. The asthenic per-

son with a deep, narrow pelvis may present great difficulty. Forty-four patients in our series were of this type, sixty were designated as pyknic and twenty-six as athletic. Twenty-nine patients were moderately overweight and two were markedly obese. The undernourished, debilitated patient must be rehabilitated by a diet high in calories and vitamins. The glycogen reserve of his liver can be bolstered by the administration of glucose. As a rule, however, his prospects are much better than those of his obese neighbor. The surgeon should consider the matter carefully before venturing to perform a combined abdominoperineal resection on a stout person. The faulty metabolism and lowered resistance of such a person make him a poor risk to start with. At operation, exposure is difficult, palpation of nodes and vessels faulty, and the movements of the surgeon are hampered by the deposits of fat. Both carcinoma and infection spread rapidly in adipose tissue and its poor healing qualities are well known. Loss of weight was noted in 67 per cent of the cases in our series; in about half of these it was marked. Dietary restrictions in an effort to alleviate distress referable to the intestine often had been a contributing factor. Dehydration was noted in only two cases and was remedied readily by the administration of parenteral fluids.

4. *Complicating conditions.*—Complications need not be contraindications to operation. By collaboration between surgeon and internist many of these can be controlled so adequately that they have little effect on the risk of operation. Often these conditions will improve postoperatively. Anemia is not often a prominent finding among these patients as it is among those who have lesions of the right half of the colon. A slight degree of anemia was present in approximately half of the cases and moderately severe anemia in thirteen cases in our series. Patients who have marked anemia should receive a blood transfusion before operation. This was necessary in only one of our cases. Generalized arteriosclerosis was noted in ten cases in our series, mild hypertension in thirty-seven, severe hypertension in three. One patient had angina pectoris. Extrasystoles were noted in nine cases and paroxysmal tachycardia in one. Cardiac hypertrophy was noted twice, but in no case was preoperative digitalization required. Pulmonary abnormalities were present in twenty-one cases; of these basal rales and pleural adhesions were the most common. Senile emphysema was noted in three cases, bronchitis in one, asthma in two, mild bronchiectasis in two, old healed tuberculosis in three, and chronic active tuberculosis in one. Questionable metastatic lesions were present in the lungs in five patients; two patients had duodenal ulcers, three were known

to have diseased gallbladders, two had diverticulosis (one of whom had diverticulitis) and eleven had inguinal hernias. One recto-vaginal fistula and two anal fistulas were discovered.

The most common urinary abnormality was pyuria which occurred in about a fourth of the cases. Cylindruria was noted in four cases. One patient had had one kidney removed several years previously. Evidence of retention of nitrogen was not found. Benign prostatic hypertrophy was present in seven cases, in three of which it was associated with residual urine. This complication was cared for by the routine practice of inserting an indwelling catheter in all cases before removal to the operating room. There was one alcoholic patient and one senile patient. Five patients had adenomatous goiters and seven had upper respiratory infections which had to be cleared up before they could be subjected to operation. One patient had diabetes which was readily controlled with insulin; another had a mild form of diabetes which responded to dietary restriction, while a third patient had renal glycosuria. Results of flocculation tests for syphilis on two patients were positive.

5. *General condition.*—Perhaps the most important factor affecting the risk is the general condition of the patient. This is the summation of all other factors, gleaned from careful anamnesis, physical examination and laboratory studies. In the opinion of the clinician, 120 patients were in good condition, fifteen in fair condition, twenty-four in poor condition and four in very poor condition.

6. *Metastasis.*—Extensive metastasis contraindicates operation. In five cases there was questionable pulmonary involvement by carcinomatous deposits.

Local considerations. 1. *Situation of growth.*—The growth was in the lower portion of the rectum in thirty-two cases, in the middle portion in thirty-seven, in the upper portion in thirty-seven, in the rectosigmoid in thirty-seven and in the lower portion of the sigmoid in twenty cases. In eighty-nine cases the lesion had been present long enough so that it nearly or completely encircled the wall of the bowel. According to Miles[13], this indicates a duration of almost two years. In thirty-four of our cases the lesion involved predominantly the anterior wall; in twenty-two cases, the posterior wall, and in sixteen cases, the right or left lateral wall. In two cases the location of the growth was not recorded. Growths situated anteriorly are the least satisfactory from the standpoint of removal.

2. *Size of growth.*—Lesions were designated as large when their greatest diameter exceeded 6 cm. There were ninety-four such

lesions. There were sixty-nine small lesions, in which the diameter was less than 6 cm.

3. *Type and grade of growth.*—All the tumors in this group were adenocarcinomas. Fifty-four were graded 1, according to the classification of Broders, eighty-three were graded 2, nineteen were graded 3, and seven were graded 4. As Jones[6] has pointed out, grading should not influence the decision as to operation. Its greatest value is in postoperative prognostication.

4. *Fixation of growth.*—In forty-nine cases fixation was not noted on digital or proctoscopic examination. In fifty-two cases infiltration without actual fixation had occurred. Slight fixation was present in fourteen cases, moderate fixation in thirty-eight, very marked fixation in nine, while in one case absolute fixation was thought to exist. In one case a malignant anal fistula was present. The degree of fixation, as determined on clinical examination, may be very misleading and differ greatly from that found when the growth is examined from within the abdomen at operation. Mobility from below means only that the growth can be removed. It tells nothing about operability, which is determined by the extent of spread or evidence of metastasis found at operation. Furthermore, lack of mobility from below does not mean inoperability.

5. *Obstruction.*—The growth produced no obstruction to the lumen of the bowel in forty-nine cases, and slight to moderate obstruction in 100 cases, while in fourteen cases the lumen was narrowed to 1 cm. Many of these patients suffered from symptoms of obstruction but in only two cases were there definite objective signs of obstruction with clinical evidence of a dilated bowel, even in the presence of such high degrees of stenosis. The slight degree of abdominal distention existing in the two cases mentioned, promptly disappeared after routine preoperative preparation. In general, cases in which obstruction is present are unsuitable for one-stage combined abdominoperineal resection. The bowel is dilated, its wall edematous, its vessels are engorged and extensive manipulation is undesirable. Such patients tolerate operation poorly and a preliminary decompressive operation, such as cecostomy or colostomy, with subsequent resection usually constitutes the safer course.

6. *Previous treatment.*—Polyps or "tumors" had been removed previously by excision or cautery in four cases. In four additional cases, irradiation had been employed. In three cases polyps were fulgurated preoperatively during the visit at the clinic at which resection was performed.

Criteria of Surgical Selection

Clinical selection weeds out the cases in which extensive metastasis is present and removes from consideration for one-stage combined abdominoperineal resection certain cases in which the risk of operation is great. In the absence of obvious metastasis, practically all patients should have the benefit of exploration. The final decision as to resectability can be made only at operation. The degree of internal fixation, and the presence of nodal and visceral metastasis can be determined only at that time. What the surgeon finds at operation will be the final determining factor as to the type of operation to be employed. In some cases conditions may be such that a radical operation is practically forced on the surgeon if he is to help the patient, even though the patient is in such poor condition that the risk is great. In other cases it may be found useless or unwise to proceed with a radical operation, regardless of the excellent general health of a patient.

Each surgeon has his own criteria which serve as indications for a certain operation but as he proceeds with the operation, extenuating circumstances may cause him to alter his course. As one of us (Mayo)[10] has written previously, certain conditions at the time of operation are favorable for carrying out the one-stage combined abdominoperineal resection. These are as follows:

1. *The bowel should be adequately prepared.* This was accomplished in all our cases by routine measures consisting of a low residue diet, purgation, and rectal irrigations carried out over a period of forty-eight hours or longer. As Jones[6] has said, adequate preparation accomplishes as much as preliminary colostomy. In addition, in 142 cases intraperitoneal vaccine was administered preoperatively, a precaution which we feel adds definitely to the safety with which operation on the bowel can be performed. If adequate preparation of the bowel cannot be accomplished by routine measures, surgical decompression by cecostomy or colostomy is indicated, with subsequent resection, as a stage procedure.

2. *The liver should be free of metastasis.* This is not an invariable rule. If resection will offer the patient a considerable period of comfortable existence, it is performed. Death from metastatic growths in the liver is less odious than death from a large ulcerating carcinoma of the rectum, with all the anguish and distress which can accompany it. Cattell[3, 4] performed resection in 10 per cent of cases in which metastatic lesions were present in the liver and he concluded that it is justifiable if the operative mortality rate can be kept below 20 per cent. In four of our cases the surgeon felt

that the liver was involved by the malignant process, but in no case was this extensive. In thirteen cases nodules were palpable in the liver, the nature of which was uncertain. As we have shown elsewhere[11], the ability of the surgeon to detect and evaluate the nature of lesions of the liver is rather accurate.

3. *There should be no undue intra-abdominal obesity.* The reasons for this already have been elaborated on. Although this is an excellent working rule, it is one which the surgeon occasionally is obliged to break. In the case of certain growths of the lower portion of the sigmoid when extraperitoneal resection is not feasible on account of obesity, combined abdominoperineal resection may be a simpler and safer procedure. Likewise, the presence of polyps, additional carcinomatous lesions or extensive and high-lying lymphatic involvement may demand a more radical procedure than can be performed by any method other than combined abdominoperineal resection. In general, however, marked intra-abdominal obesity is a strong contraindication to this operation.

4. *The growth should be movable and amenable to resection from the standpoint of fixation.* A growth which seems fixed on digital or proctologic examination may be relatively mobile when approached from above. The clinician who proclaims a tumor inoperable on the basis of local findings, without benefit of exploration, may well be assuming an unjustifiable responsibility. Resectability can be determined only by laparotomy, and even then, as Stone and McLanahan[16] have pointed out, the surgeon sometimes cannot be certain until he actually has undertaken removal of the tumor. Miles[13] originally felt fixation did not occur until penetration of the fascia propria had taken place. It would appear, however, that fixation is often on an inflammatory basis[13]. Bargen and Larson found local attachment to be on an inflammatory basis in 42 per cent of 260 cases of carcinoma of the rectum with fixation. Furthermore, even active extrarectal extension of the tumor itself need not preclude resection. Extrinsic malignant invasion was demonstrated by the pathologist in sixty of our cases; this was to the serosa or perirectal fat in forty-seven cases, to the wall of the bowel in thirteen, to the prostate gland in one, to the mesosigmoid in one, and to the anal margin in one.

Fixation, extension and occasionally other related pathologic conditions necessitated more extensive surgical procedures at the time of resection in a number of our cases. In three cases resection of the prostate was performed; in two cases the posterior vaginal wall was excised; in one case a rectovaginal fistula was excised and the

vaginal opening closed. Hysterectomy was performed in two cases and myomectomy in one. Pathologic adnexa were removed in five cases. Postoperative irradiation was employed in a number of these cases.

Fixation may even be an indication, rather than a contraindication, for one-stage combined abdominoperineal resection. In exploring the pelvis, the surgeon may inadvertently break into the tumor and feel that immediate removal is the safest procedure. In general, however, when extreme fixation or an abscess is encountered, it is best to perform operations in stages with preliminary diversion of the fecal current, in order to give inflammatory processes a chance to subside.

Involvement of regional lymph nodes was discovered in 44 per cent of our cases. Extensive or high-lying nodal involvement occasionally led to the performance of one-stage combined abdominoperineal resection in cases in which it had not been previously contemplated.

The subject of polyps may be considered with advantage at this point. In ten cases of our series polyps were found in the vicinity of the growth on proctologic examination. The presence of polyps should be an inducement to radical removal of considerable adjacent bowel. The need for fairly extensive excision of bowel in all cases, however, is indicated by the fact that the pathologist also found polyps in sixteen additional cases, in five of which they had already undergone malignant degeneration. This makes a total of twenty-six cases in our series in which polyps were found. This dangerous tumor-forming propensity of the mucosa in the neighborhood of rectal carcinoma, which has been described so convincingly by Lockhart-Mummery and Dukes, should be the most eloquent argument for wide excision of adjacent bowel. The opportunity for performing this safely and conveniently is afforded by no other operation than the combined abdominoperineal resection.

5. *The operation should not require more than from one hour to an hour and twenty minutes.* The experienced surgeon, after a careful survey of the field, knowing his own capabilities and those of his assistants, can estimate with considerable accuracy the time which the operation will require. So formidable a procedure as one-stage combined abdominoperineal resection will claim many lives from shock alone if too long a time is spent in its performance, but it is well to recall the words of the late Lord Moynihan, "Speed should result from the method and the practiced facility of the operator and should not be his first and formal intention. It should be an accomplishment, not an aim."

If the operation will be long and excessively difficult, some other procedure should be employed. The presence of extensive adhesions from some previous operation hampers the movements of the surgeon and prevents adequate exploration of the peritoneum, liver, lymph nodes and colon. Extensive adhesions between the tumor-bearing segment and adjacent structures may entail painstaking and difficult dissection. A large growth in a deep pelvis may be very hard to dislodge. Such factors as these, which will prolong the operation, must be evaluated carefully by the surgeon before he proceeds.

Evaluation

No one can question the selection of the cases in which the outcome was successful, but concerning the patients who died in the hospital following operation, the question, how prominent a role was played by faulty selection, can be asked. When the patients in our series who died were compared as a group to the survivors, there were no significant outstanding differences. The patients who died in the hospital were on the average five years older, their growths were more fixed, but in other respects, sex, general condition, complications and so forth, there was nothing characteristic. Peritonitis was the principal cause of death; septicemia, pneumonia, cardiac insufficiency, apoplexy, ileus, cellulitis of the abdominal wall and pulmonary embolism accounted for the remainder. When these cases are considered individually in retrospect, it was found that in several the surgical risk was poor from the start and in others factors were noted before operation which may have contributed to the demise. However, the risk of death from the operation was great for some of the survivors and many of them had the same complicating conditions. Therefore, it does not seem justifiable to censure the selection of these cases. No matter what criteria are employed, there will be some fatalities. If the sole aim of the surgeon were to keep down fatalities, the operation would be reserved for the ideal case into which classification only a small proportion of these cases falls. The important consideration, therefore, is that the surgeon, on the basis of his own experience, shall select for one-stage combined abdominoperineal resection all cases in which he feels benefit will result and the mortality rate can be kept within a reasonable limit of from 7 to 12 per cent.

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THE INTRA-ABDOMINAL APPLICATION OF SULFANILAMIDE IN ACUTE PERFORATIVE APPENDICITIS

Preliminary Report

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THE intra-abdominal application of sulfanilamide in the treatment of acute appendicitis is a comparatively new addition to the methods used in managing this disease. Thompson[1] at the Roosevelt Hospital in New York City reported the use of this drug in such a manner in 59 patients treated during 1940. The mortality rate in this group of cases was zero, and the patients seemed to have better postoperative courses and to exhibit fewer complications. In the light of his experience, we decided to use it in a group of patients presenting definite acute appendicitis with perforation and peritonitis. A report of these cases forms the basis for this report.

The mode of action of the sulfonamides[2] is thought to be in the nature of an inhibitory affect on the enzymes which split proteins into the simpler products on which bacteria live. Thus deprived of their food, so to speak, bacterial organisms fail to reproduce so rapidly and in addition fall as easier prey to the bodily defense mechanisms. In addition to this bacteriostatic affect, the sulfonamides seem to possess a certain degree of bactericidal power. In order for these drugs to exhibit such qualities certain optimum concentrations must be obtained in the body fluids and tissues. Furthermore, it seems that purulent material as seen in abscess cavities contains an inhibitory element toward this action of the sulfonamides. In such an instance, larger concentrations of the drug are required to produce the desired affect. In view of these assumptions, and the apparent lack of any deleterious affects on tissues when applied locally, the rationale for its direct implantation into the peritoneal cavity becomes clear.

An increasing number of reports are being made of the local application of sulfanilamide in compound wounds[3] and compound fractures[4]. Apparently it is of definite benefit in the prevention of infection and does not cause any local tissue damage. This would seem to support the theory advanced as to its mode of action and would appear to offer additional evidence that its local use on contaminated and infected peritoneum might be beneficial.

From the Surgical Service of Welborn-Walker Hospital

The patients comprising this series of cases were selected on the basis that they must have an acute appendicitis with peritonitis. Most of the appendices presented macroscopic evidence of perforation, and all of them were associated with definite purulent peritonitis. No attempt was made to determine whether the peritonitis was localized or generalized.

The first patient in this series was treated March 25, 1941, and the last October 15, 1941. There were 31 patients admitted during this period of time with acute perforative appendicitis as herein defined, and 21 of this number had sulfanilamide crystals implanted intraperitoneally. The remaining 10 were not so treated due to the fact that the procedure was simply overlooked, and not because of their appearance as a risk.

The usual procedure consisted in the application of 5 Gm. of powdered sulfanilamide in the peritoneal cavity about the region of the cecum and in the layers of the wound. Some patients received as high as 10 Gm. and others as little as 3 Gm. Thompson[1] states that it is safe to use as high as 20 Gm. in the presence of an appendiceal abscess. In addition to this, some of the patients were given sulfanilamide by mouth as soon as nausea had subsided. No determinations of the blood sulfanilamide levels were made postoperatively, nor was the bacterial flora of the peritoneal exudates identified by cultural methods.

The usual procedure at this hospital in the management of patients with appendiceal peritonitis is to operate upon them as soon as the diagnosis is established and any complicating factor such as dehydration is corrected. The McBurney incision is the one of choice, and drainage is resorted to in the presence of peritonitis. Drainage was used in all of the cases comprising this group. Needless to say, some of the sulfanilamide is undoubtedly lost by this procedure.

It is always difficult to evaluate accurately the effectiveness of any therapeutic procedure. In the interpretation of our results we have been guided largely by clinical impressions, as there is little else by which one has to go in a small series of cases. In the group of 21 patients under consideration, the ages varied from 4 to 65 years. There were two deaths, one in a boy aged 13 who died on the seventh postoperative day of a pulmonary embolism, and the other in a man of 20 who died 12 hours postoperatively of shock and probable gas bacillus septicemia. This gives a mortality rate of 9.5 per cent which can be compared to a mortality of 7.8 per cent previously reported by us[5] in a series of 114 cases of this type. Of greater interest, however, is that none of these patients died from

peritonitis, which is generally agreed[6] to be by far the greatest cause of death from acute appendicitis.

It has been previously noted that there were 10 other patients admitted and operated for acute perforative appendicitis during the period of this study and in whom sulfanilamide was not employed. These patients were not used as controls, but it should be stated that no deaths occurred in this small group. In addition, there were 171 operations for acute unruptured appendicitis and no deaths during the period of time included in this study.

It seems that of more importance in evaluating these patients is a study of their clinical courses. Aside from the two patients who died, and two others who became rather ill, no real anxiety was felt for any of the remaining 17 comprising this group. None of them seemed to develop generalized peritonitis, and most of them had surprisingly good postoperative courses. The incidence of ileus, vomiting or other untoward symptoms was gratifyingly small. There were no cases of mechanical bowel obstruction, subphrenic or pelvic abscess. Their wounds healed rapidly and without so much redness and induration about the sutures with prolonged, malodorous drainage as is usually seen. To us this seemed to be the most striking factor of improvement possibly attributable to the sulfanilamide.

There were no severe untoward reactions which we could attribute to the sulfanilamide. Many of these patients were slightly cyanotic, and most of them vomited, but this could easily have been the result of something else. One patient was slightly cyanotic, and presented the appearance of shock for two days following operation. He improved following blood transfusions, but on the eighth postoperative day he became slightly jaundiced. Since marked thrombosis of the veins of the iliac mesentery had been noted at operation, the jaundice was felt to be most likely secondary to pylephlebitis.

Most of the patients in this series of cases were desperately ill and were ones in whom stormy postoperative courses could be expected. The smoothness of their courses, the absence of complications, and the rapidity with which some of the wounds healed seemed to be attributable in great part to the sulfanilamide. Since the intraperitoneal implantation of this drug seems to be safe, an extensive use with it in acute perforative appendicitis would appear warranted.

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CONTROLLED FRACTIONAL SPINAL ANESTHESIA

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ONE hesitates to speak about spinal anesthesia at the present time because it seems to be regarded as the "surgeon's temptation," but to discuss this subject before an audience in Texas is like "bringing coals to New Castle." Though it was Matas, who in 1899, published the first records of its successful use in America (Phila. Med. Jour., 1899) as late as 1934 he is on record as saying (Amer. Jour. Surg.: *25:* 362-378), "Personally I regard spinal anesthesia as a supreme attainment of regional anesthesia, but I do object to the routine, indiscriminate and wholesale use to which it has been put in many quarters."

There is no doubt that a cross section of present day surgical literature gives one the feeling that in America spinal anesthesia is generally considered as an unjustifiable risk, which is in marked contrast to the attitude in Europe. Its reputation seems to be passing (we hope) through one of those deep troughs of discouragement which has followed each successive wave of enthusiasm —recklessness—death—and disappointment, which have characterized its history, since its introduction by Bier in 1898. The crests of these waves are marked (1) by the contributions of Matas, in 1899, using cocaine; (2) by Babcock, in 1904, with his use of stovaine, and (3) Pitkin, in 1928, with his introduction of spinocaine.

That the interest of surgeons in this epoch-making contribution has persisted during these years, may be explained by the unusual degree of muscular relaxation which it provides. To this, must be added the regional selectivity, and the rapid recovery which follows its administration. This is in marked contrast with the lack of selectivity: the slow recovery from, and elimination of, many of the other agents now used for general anesthesia.

We are sure there is no need for us to detail to surgeons in the South its incomparable advantages, but there is a real need for all of us to admit and discuss the dangers, for because of the latter the procedure is still under duress, and its general use in America remains limited.

Read before the Texas Surgical Society, Galveston, Oct. 6, 1941.

Among the disadvantages and hazards may we offer the following for discussion:

1. We must admit that up to the present time it has been generally administered as a "one-shot" procedure, the total dose being given at one time, and when once introduced into the subarachnoid space it cannot be withdrawn. This method may be compared to the primitive manner in which ether was administered in former days, viz., the pouring of the most of a can of ether, as a single dose, upon gauze placed in the apex of a hollow cone of cardboard, and then holding the open end of this cylinder over the nose and mouth of the patient until narcosis was carried almost to the lethal stage. The surgeon would then try to complete the operation before the ether had lost its effect.

Please note that we speak of these procedures in the past tense, and it is because of our experience in Philadelphia during the last two years with the so-called continuous spinal anesthesia suggested by Lemmon, that we have almost abandoned the use of the single mass dose, and are now using procaine in varying amounts and intervals of time between the injections so as to meet the needs of the individual patient and the particular surgical procedure. As the point of the needle remains in the thecal space during the whole operative period, it is possible to withdraw it at any time, or to postpone the withdrawal until the last skin suture has been placed.

Lemmon claims that the greatest concentration of the drug occurs at the point of the needle, and that the nerve tissue promptly recovers its function when a concentration of the drug falls below a definite level. After the anesthesia is established, it takes a relatively small dose of the drug to maintain the necessary level required for the individual patient and the particular procedure, and this over long periods of time. Thus Lahey recently records five and six hour operations, and we have maintained anesthesia and relaxation for four and five hours.

The depth and duration of the anesthesia are not only dependent upon the size of the dose, and the intervals between its administration, but also upon the condition of the patient and the character of the operation, i.e., thus intra-abdominal operations near the diaphragm, or involving the root of the mesentery, require that larger doses be given at shorter intervals.

In this way it is possible to have *under our control at all times* the dosage of the anesthetic agent, and in contrast with any other method of general anesthesia, it can be made regional in effect, eliminating the necessity of drugging all the body tissues when regional anesthesia only is required. This obviates the 24 to 48 hours

postoperative or reaction period, required for the elimination of the agent. Maxson estimates that the average ether anesthesia requires 15 minutes for induction, 40 minutes for operation, and 115 minutes for recovery. This can be summarized by the statement that 30 per cent of the total period of ether anesthesia is usually wasted needlessly in the time required to react from the drug.

2. The next great disadvantage, which to us appears as its greatest hazard, is the dramatic and at times almost catastrophic *fall of blood pressure,* which occurs within a few minutes after the giving of the drug. Maxson reassuringly tells us, "Its causes and mechanism are now well understood, and reliable means of combating it have been developed." But from our clinical experience we are not so sure of this, for until we employed the intermittent technic of Lemmon we continued to feel that the control of this fall of blood pressure was not understood, nor was a dependable means of control available.

Lemmon claims, and we have corroborated this by our own experience, that the *initial injection* of the procaine has a more toxic effect than *subsequent injections.* By using a small initial dose (25 to 50 mg.) before the preparation of the field of operation and the starting of a continuous 10 per cent glucose and saline venoclysis (which is given routinely) we have found that a very slight lowering of the blood pressure occurs, never as marked, and usually absent, following the giving of subsequent injections. This is in contrast to the reactions we have experienced when using the massive single dose technic.

It is now generally accepted that this blood pressure fall results from:

a. A block of the vasomotor system.
b. A block of the cardiac accelerator nerve.
c. Paralysis of the intercostal muscles.

Bower, from his experiments in ligating the arachnoid sac at various levels, claims that respiratory embarrassment is the most important factor in the blood pressure drop, and that this fall is in direct proportion to the level of the block. If kept below the eighth thoracic segment, very little fall will occur. With the small initial dosage we employ, a high level of anesthesia cannot result provided the patient is in the recumbent position.

Severs and Waters summarize the mechanism of blood pressure fall in the following way:

1. An initial decrease in peripheral resistance to blood flow by a vaso-nerve and skeletal-muscle paralysis.

2. A decrease in minute-volume respiration, accompanying the intercostal nerve-paralysis.

3. Inadequate oxygenation of the blood as a result of the two foregoing reactions. This is based upon their experimental work in which they found that samples of venous blood after a spinal anesthesia, which was accompanied by circulatory depression, showed a low oxygen content and a raised carbon dioxide proportion.

4. Diminished blood flow and progressive loss of vascular tone all over the body, resulting in—

5. Acute cardiac failure, both from the result of oxygen starvation and failure of the respiratory mechanism as the flow of nutrient blood becomes inadequate. The latter occurs while the heart is still capable of being revived by oxygenation. They consider these claims have been proved by the results obtained with artificial respiration and the free use of undiluted oxygen.

We administer 100 per cent oxygen as a routine procedure, giving it continuously through a nasal catheter during the entire operative procedure. This provides an alveolar oxygen concentration of about 45 per cent. As a result, the cyanosis and the dark colored blood which is so common with the massive single dose technic is practically eliminated.

Blalock claims that if the lower eleven dorsal and first three lumbar roots are completely blocked, every blood vessel in the body, from the vertex to the toes, is completely relaxed; the heart rate falls to 40, 50 or 60; no pulse may be felt at the wrist; and while there may be a soft, faint pulse in the carotids. With the completely relaxed vascular system and particularly the relaxed muscular system, the blood lies in the dependent portions of the body as in a cadaver. The skin is pale, and incisions through the non-dependent portions of the body are dry and bloodless.

Under these conditions cerebral anemia is bound to result if the patient remains in the horizontal or semi-Fowler position. Hence the head, heart and lungs should be dependent, and the rationale of the routine use of the Trendelenburg position, which has been persistently advocated by Labat, is explained and approved. Our patients are placed in the Trendelenburg position ten minutes after the giving of the first dose of procaine (the time estimated for the fixation of the drug); they are maintained in this position until the placing of the skin sutures.

The third disadvantage, which is also a real hazard, is the direct toxic or allergic effect of the drug which some patients exhibit. These reactions, of course, are unavoidable unless revealed by a

history of previous hypersusceptibility. Probably all of you have encountered (as we have) fatal reactions of this kind. And to prevent such catastrophes it would seem logical to claim that they can be minimized at least if but small doses of the drug are used for the initial injection instead of a massive single dose. Further, it would also seem reasonable to claim that the possibility of withdrawing the procaine with the first appearance of toxic symptoms would be a definite advantage.

The fourth disadvantage, which is generally admitted, is the limitation of the operative time provided by spinal anesthesia. With novocain, primocaine and procaine we have found that the average length of time was 55 minutes, and to prolong the operative period we have had to start supplemental anesthesia at the end of 60 minutes. With nupercaine this period was slightly lengthened to 1½ hours, and with pontocaine 1½ to 3 hours. In our experience with these drugs we have found the price one had to pay for this prolonging of the anesthesia was an increased incidence of fatalities or near deaths. Further, in spite of this improvement in the agents, it was rarely possible to complete the operation with any one of them, or at least to close the laparotomy wound, before the effects of the drug had worn off to such an extent that some form of supplemental general anesthesia had to be used, when the operation lasts more than two hours.

In a general way it seems fair to say that it is now accepted that spinal anesthesia should not be used in sub-standard surgical risks, and we agree with this attitude from our previous experience with single massive doses. But the type of anesthesia and the muscular relaxation that can be provided by spinal anesthesia is not only desirable but often necessary in abdominal surgery such as obstruction, perforation, or rupture of the pelvic and abdominal viscera. Also it is true that this is rarely required for the entire duration of the operative period, but for certain stages only. We have found that by combining local infiltration with *controlled fractional interrupted spinal* anesthesia, the two can be safely used in abdominal operations in the group of sub-standard patients.

The spinal needle is introduced and connected with the reservoir system containing the drug, but nothing is given intrathecally until the occasion demands. The patient is then placed in the position of operation and as much surgery as possible is performed under local infiltration anesthesia. If and when more anesthesia or relaxation is required than can be obtained by regional and local anesthesia, a very small dose of the drug is given intrathecally (5 mg.) and this is repeated if and when it is necessary. Further, if this added

medication is not well borne, it can be immediately withdrawn, and we have found that in three minutes the effects of the intraspinal agent will disappear.

Credit for this development and its application in our group is due to Dr. Jonathan E. Rhoads.

After this glowing and enthusiastic presentation of the advantages of *controlled fractional spinal anesthesia* you are probably suspicious. As with any new procedure—greater experience and more time will undoubtedly expose dangers and complications which have not been encountered thus far.

In spite of Lahey's claim — made at the last meeting of the American Surgical Association—"This method of continuous spinal anesthesia has opened up a new era in abdominal surgery," in a recent letter he said, "It must be realized that the promiscuous use of any form of spinal anesthesia is dangerous."

The unusually shallow and almost imperceptible respiratory excursions that occur with this method of anesthesia, and prolonged over unusually long periods of time, should result in greater accumulations of nasopharyngeal and bronchial secretions than with inhalation, general, or single dose spinal anesthesia over short periods, and it does. To this must be added the hazard of the need for barbiturates before, and repeated small doses of morphine during these long periods of anesthesia, in order to control the apprehension of the patient.

This requires more and constant care on the part of the anesthetist, who must keep the respiratory tract free from secretions and maintain an unobstructed airway during the entire period. Both frequent aspiration of the nasopharynx and hyperventilation with oxygen under pressure, are usually required, at least every 15 minutes during and at the close of operations of more than one hour in length, the trachea should be aspirated by means of a soft rubber catheter, as recently suggested by Haight, and this should be done before the patient leaves the operating room.

Our thesis then may be stated as follows:

1. If the type and degree of anesthesia which can be obtained by spinal anesthesia cannot be produced in any other way, it would seem justifiable, at least, to try to overcome the unusual hazards and disadvantages which all agree may attend its use when massive single doses are employed.

2. We feel that in our own limited experience all of the five hazards and disadvantages enumerated above have been definitely les-

sened, and some eliminated, by abandoning the "single-shot" technic now generally practiced, and in its place employing the suggestion of Lemmon, i.e., the intermittent injection intrathecally of varying doses of procaine at varying periods of time during the entire operation.

The term "continuous" spinal anesthesia is not an accurate description of the procedure, and we offer in its place "controlled fractional" spinal anesthesia.

3. We have found controlled fractional spinal anesthesia to be of peculiar value when used as a supplement to local regional infiltration anesthesia, in sub-standard surgical risks.

4. Finally, during the two years we have used this type of spinal anesthesia, in 594 cases we have not had a fatality to occur within 24 hours after its administration. Dr. Lemmon has had 1100 with no deaths. We arbitrarily use this period of 24 hours because we consider it eliminates the question of death being due to the anesthetic. However, during the same period we have had 10 fatalities from the use of single massive doses of the drug in 6313 cases.

PROBING THE COMMON DUCT THROUGH A T-TUBE 4 WEEKS POSTOPERATIVELY

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OBSTRUCTION of the common duct from any cause is a serious and urgent matter; its importance increases as time passes. Stones are the most frequent cause. We associate jaundice, pain, fever and chills with stone in the common duct. If jaundice is absent, we are apt to dismiss this possibility. This may be a costly and painful error. Jaundice is not always present in common duct stone. Judd and Marshall[1] found it absent in 26 per cent of 1608 cases. Graham[8] found it absent in 17.4 per cent. Chills and fever likewise are inconstant. One may find a gallbladder packed with stones in a patient without jaundice, yet a stone may also be in the common duct. Judd estimates[6] stones are present in the gallbladder alone in 86 per cent of all cases, in the common duct alone in about 6 per cent, and in the gallbladder and common duct together in 7 percent. Allen[2] indicates that both gallbladder and ducts have stones in about 13 per cent. The Lahey Clinic[6] figures are nearer 20 per cent. Graham[8] puts it as high as 22.4 per cent. It is well to remember that "a patient with gallstones has a 13 to 20 per cent chance of having one or more stones in the common duct in addition."[6] One should expose and palpate the common duct routinely in doing every cholecystectomy. If it is enlarged, it is so because it is obstructed; the longer and more complete the obstruction, the greater the enlargement and dilatation. Graham[8] gives a summary of accepted indications for exploration of the common duct, as follows:

1. The presence of jaundice, or a history of jaundice with previous attacks
2. A dilated common duct.
3. A thickened common duct.
4. An enlarged or thickened head of the pancreas.

Drainage of a dilated common duct by a T-tube is a standard procedure. It provides biliary drainage, helps to control infection, and acts as a safety valve if the sphincter of Oddi be temporarily closed by traumatic edema, mucous plugs, undiscovered stones, or other causes.

Sometimes a common duct stone is overlooked. One may be found, and a smaller one not discovered. A stone of small size may be pushed into the duodenum during palpation of the common duct. Or such a stone, causing intermittent attacks of jaundice, colic, or

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both usually, may be dislodged during the exploratory process and not discovered until symptoms recur again. These are good reasons for providing a safety valve drainage of the common duct until its patency and full function are demonstrated.

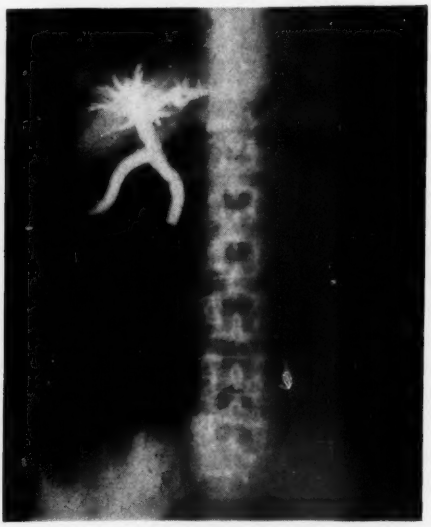

Fig. 1. Lipiodol injection of biliary tree.

When a T-tube drains a large amount of bile daily over a considerable period of time, the stools remain clay-colored, it is probable that a common duct stone is still present. Cholangiography may show it, and certain methods of chemical fragmentation are useful for breaking it up. Probably one of the best methods is the use of ether and alcohol, as employed by Wesson and Walters,[6] using 5 c.c. of a mixture of two parts of ethyl ether and one of grain alcohol, injected through the T-tube on several successive days. Pribram[4] used instillation of ether, and relaxed the sphincter of Oddi with inhalations of amyl nitrite (Butsch et al[5]), and the fragments were forced from the common duct into the duodenum. Best and Hicken[7] have increased the flow of bile by administration of dehydrocholic acid and have caused relaxation of the sphincter of Oddi by instilling warm oily solutions into the duodenum. The principles used are first, to break up the stone into smaller pieces, or fragmentation; second, to raise the intraductal pressure; and third, to cause expulsion of the stone or its fragments into the duodenum by relaxation of the sphincter of Oddi.

Where these methods do not give satisfactory results, bile continues to pour out through the T-tube, the stools remain clay-colored,

and the patient loses appetite and strength, the maneuver described below may be worth considering. I have used it in only one case, and have no conclusions to draw from so limited an experience. But since it may be of help to someone now faced by a similar problem, I feel justified in making public this brief preliminary report.

Fig. 2. Lipiodol injection—90 minutes later. Shows most of lipiodol has passed into duodenum.

Report of Case

Mr. E., aged 74, complained of attacks of pain in the epigastrium, associated with fever, and followed by jaundice. The gallbladder had been drained 18 years previously; he did not know if it had been removed or not. A stone had been removed suprapubically from the urinary bladder at 71 and from the left ureter a year later.

On May 6, 1941, he had a gastrointestinal upset consisting of some pain in the upper abdomen, followed by slight fever and slight jaundice. Physical examination was negative except for the jaundice. Physical examination was negative except for the jaundice. He was 15 pounds overweight. Hemoglobin was 92 per cent, the white count 3,700, urinalysis negative.

On May 20 he had another gastrointestinal upset, associated with chills, and fever of 103. Jaundice became very distinct. The x-ray, made by Dr. B. F. Smith, showed no evidence of a gallbladder. Dr. Smith made a diagnosis of common duct stone and referred him to us, advising operation.

He was admitted to St. Joseph's on May 23. The temperature was normal, blood pressure 196/100, pulse 72. Coagulation time 2 minutes 30 seconds, bleeding time one minute 45 seconds. Red blood cells 4,000,000, white blood cells 8,400. The urine showed a heavy trace of bile, 80 to 90 white cells per low power field. The icterus index was 100.

Preoperatively he received vitamin K, ketochol tablets, high carbohydrate diet. On May 27, under spinal anesthesia, operation was done by Dr. F. L Barnes. A nasal duodenal tube had been placed in his stomach just prior to operation, and continuous suction was kept up all during the operation. There were extensive adhesions. No gallbladder was found. The common duct was located, and we thought we could feel a small stone in it behind the duodenum. It seemed to pass into the duodenum during the manipulation. The head of

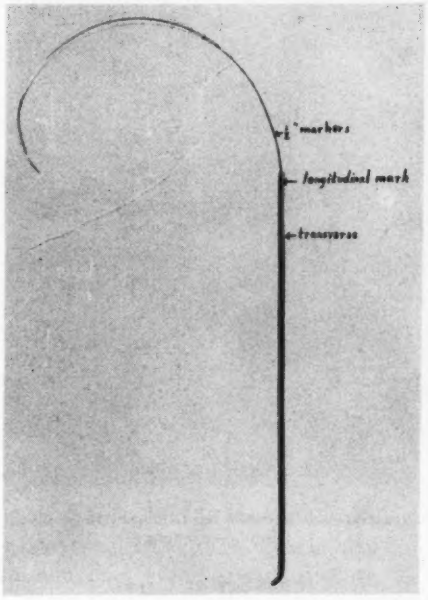

Fig. 3. Metal guide tube with probe in place. Note that when tip of probe is at bent place, the first mark on probe is at other end of guide tube. Note longitudinal and transverse marks.

the pancreas was very hard. The common duct was opened and thoroughly probed, passing the sounds and scoops out into the duodenum and up into the hepatic ducts also. The stone was not found, and we felt it had passed on into the duodenum. A T-tube was placed in the common duct, and brought out through a stab wound, the main incision being closed in layers.

He had a very smooth recovery. He had a large amount of bile drainage through the T-tube, but we thought the marked pancreatitis was largely responsible. On June 19, some three weeks after operation, a lipiodol injection of the biliary tract was made (fig. 1). It was 1½ hours before most of the lipiodol had passed through into the duodenum (fig. 2). We felt fairly well satisfied that the common duct was open, but as the flow of bile continued unabated, flowing an estimated 500-600 c.c. every 24 hours, (practically the entire liver output) we used the chemical fragmentation method as described on June 26, and June 27 in case a small stone was still there. We did not use any drugs to relax the sphincter of Oddi such as amyl nitrite, owing to his advanced age. Only 2.5 c.c. of the mixture could be used due to pain. On

June 28, 24 hours after the second injection, there was almost a cessation of drainage. We were pleased with this, but we had already determined to try actual probing of the common duct through the T-tube if these other methods failed, so, after carefully reviewing the problem, we decided to probe the common duct and establish its patency without question.

The T-tube in place was a 22 F. An exact duplicate of it was obtained, and a thin piece of copper tubing found that would just slide inside of it. The distal end of this tube was bent so as to direct a probe in a fixed direction. The metal tube was slid down the new T-tube, to where it just touched the bottom of

Fig. 4. Probe passed one-half inch down T-tube.

the long arm, and a transverse mark made on the metal tube at this point. A longitudinal mark was made on the straight end of the metal tube to indicate which way the probe was being directed. The probe itself was made of piano wire, with a small lump of solder on the tip end. When this tip end just appeared at the bend of the metal guide, the first solder mark was just at the other end of the guide tube (fig. 3). The other solder marks were placed ½ inch apart on the wire probe, so that by counting the number of marks passed in, we could tell exactly how far down the common duct our probe had passed. Mr. Wolf Goodman, an engineer of Houston, made this device for us.

On June 30 we took our patient to the x-ray room. The metal tube was oiled with sterile mineral oil, and passed down the T-tube until the marks showed it correctly placed, and the probe was passed until we knew its tip had just appeared at the bend. An x-ray was made to confirm this. The probe was then passed ½ inch down, and its position again checked by x-ray (fig. 4). This being correctly done, it was then passed on until the tip of the probe had passed 4 inches down the common duct from its starting point, the junction of the limbs of the T-tube (fig. 5). No difficulty whatever was experienced in passing the probe, and nothing resembling a stone was touched by the probe, as far as could be felt.

There was some increased drainage for a few days, and then it stopped. After there had been no drainage for 10 days, with the T-tube clamped off, the T-tube was removed.

There was drainage for some little time after removal of the T-tube, but it ceased completely.

Fig. 5. Probe has been passed four inches down the common duct into the duodenum.

Comment

As far as we know, this is the first time the common duct has been probed successfully several weeks postoperatively through a T-tube.

We do not know if this maneuver will prove of much value to the profession.

We feel, however, that in cases of suspected common duct obstruction where no stone has been found, or perhaps one remains that was overlooked at operation, and where a large amount of bile drains daily through the T-tube, the surgeon will be anxious to try all methods known to man for opening the common duct short of another operation. This case demonstrates that one can pass a probe down the common duct from the outside through a T-tube already in place. We offer this method as an additional tool in the management of these difficult cases.

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THE USE OF THE SHROPSHIRE TECHNIC IN THE WATKINS-CHAUTA OPERATION FOR UTERINE PROLAPSE

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THERE are many methods of treating prolapsus uteri and nearly all of them have points of virtue. The Surgeon should know the various technics so that he may select the one that promises to give the best results.

The Watkins-Chauta operation has been pretty well accepted throughout the surgical world as a standard procedure in certain women who have passed the child-bearing period.

Practically all surgeons agree that leaving behind the gland-bearing part of the uterus offers a dangerous possibility: i.e. the endometrium of the body and the endocervical tissues which are prone to produce cancer of the cervix.

Dr. L. L. Shropshire in his original paper published in 1914, A New Supra-Vaginal Plastic Hysterectomy,[1] described an operation for the treatment of prolapse of the uterus in the following language: "The operation is especially applicable in all procidencias after the child-bearing period."

The principles set forth by Shropshire seemed to me so valuable, and so few medical men knew what he was advocating, that I undertook to bring to the attention of the profession his valuable contribution by a paper read before the Southern Surgical Association[2] in 1936.

Since I have done a number of cases with complete satisfaction and have suggested the advantages of the Watkins-Chauta operation for prolapsus uteri, I decided to present a short paper to describe this technic for the surgeon who has decided upon doing an interposition operation for prolapse.

I have repeatedly called attention to the value of this method of doing a hysterectomy over that of the various types and modifications of hysterectomies but I still have failed to make converts, so I am venturing to present this paper for your consideration.

Shropshire claimed that there was much less disturbance to the patient, and that there was a much shorter convalescent period than in the ordinary hysterectomy practiced by other gnyecologists.

Presented before the Texas Surgical Society, April 7, 1941, at Temple, Texas.

This was due, he claimed, to the preservation of the complete blood and nerve supply to the uterus. No nerves are tied and cut and none of the larger arterial trunks are cut and tied.

In my previous paper I called attention to its wide application in different conditions. In this paper I shall discuss only its use in operations for prolapse of the uterus.

In doing this operation where it is suitable for a prolapse the uterus is pulled down with a volsellum and the incision through the

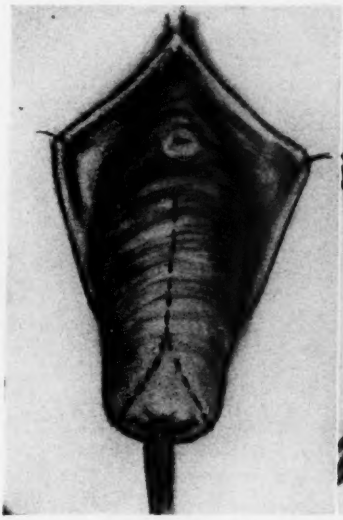

Fig. 1. Outline of incision through anterior vaginal wall. Uterus drawn down.

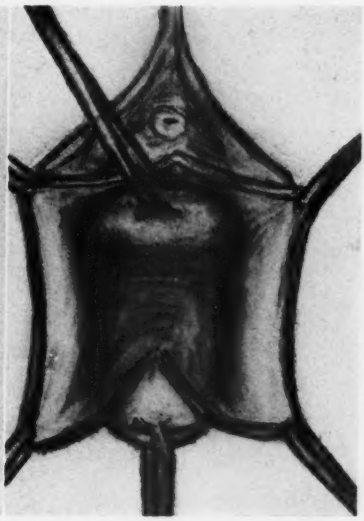

Fig. 2. Anterior Vaginal Wall reflected, bladder dissected from body of uterus, and fundus drawn through opening into peritoneal cavity.

anterior vaginal wall is made as shown in fig. 1. The bladder is then dissected away from the uterus until the peritoneal reflection from the bladder on to the fundus is reached. The uterus, tubes and ovaries are brought out and carefully examined and if normal they are not disturbed further. At this stage rubber-covered clamps are placed on either side of the uterus for the control of bleeding. The slabs or sections of the uterus are cut as shown in fig. 3.

In cutting these slabs, or sections, we try to keep out of the uterine cavity, by removing in this mid-section the entire glandular part of the organ. We close the posterior endometrial border with a 00 ten-day chromic catgut suture (fig. 4). The flat cut surfaces

Fig. 3. Uterine body in center A with slabs B & B cut away.

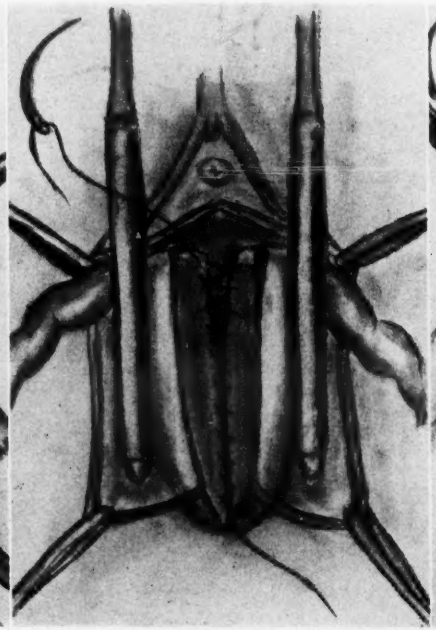

Fig. 4. Posterior margin stitched with No. 5 chromic catgut.

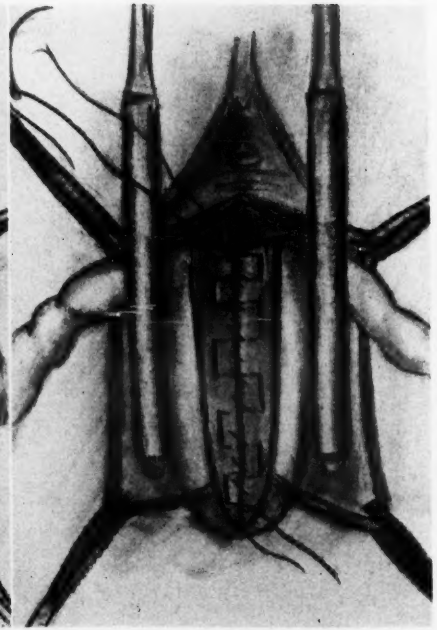

Fig. 5. Quilting stitch through body of slabs for approximation of surfaces.

of the slabs or sections are sutured together, using a ten-day No. 1 chromic catgut suture (fig. 5).

A mattress stitch is used so as to approximate the slabs and compress all small vessels to prevent bleeding. This is well shown in fig. 5. One then resumes the 00 chromic catgut suture which was used posteriorly and carries it forward over the fundus to close the anterior borders as in fig. 4. This is tied to the end of the starting suture in the cervical part of the slab. The remaining body of the uterus is now pushed into the abdomen. If its position seems to remain with sufficient firmness then the reflected peritoneum on to

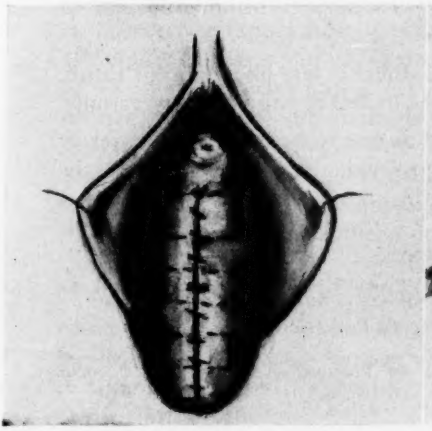

Fig. 6. Anterior border of uterus closed and the fundus fixed forward, the bladder lying behind. Vaginal flaps closed.

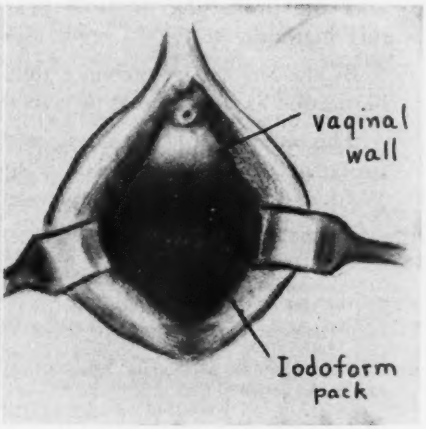

Fig. 7. The uterus pushed back and held by iodoform gauze pack.

the bladder is attached by fine chromic catgut to the cervico-uterine junction, thus closing the opening into the abdominal cavity. The vaginal wall is closed in the manner generally practiced for closing cystocele as in fig. 6.

Should the structures seem not to support the organ in proper position then I think it is better to interpose the uterus and let the bladder fall behind as in the regular Watkins-Chauta technic, with which all are familiar.

By this Shropshire technic the size of the organ is materially reduced, the mucous or cellular part of the womb is eliminated and the supporting structures of the uterus have been materially shortened. The problem of the occurrence of cancer in the cervix or body is settled.

The cases operated on by me have done so well, and the procedure seems so sensible and rational that I have brought it to your attention that you may consider its merits and use it as an improved method of handling suitable cases of prolapse of the uterus.

My experience has been that the patients do better as claimed by Shropshire than they do where the vessels and nerves are cut and tied as in the usual hysterectomy. I think the results are better than those obtained by the method known as the Mayo technic which was to suture the broad ligament and other structures together in doing the hysterectomy.

The Mayo technic for a hysterectomy was a great improvement over the prevailing methods practiced before the introduction of this method.

By the Shropshire technic I think there is less likelihood of future herniation as so often happens in the ordinary vaginal hysterectomy.

This operation is not advocated as one to be done in all cases of prolapse of the uterus, but is most valuable in cases where the Watkins-Chauta operation is used.

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TORSION OF THE APPENDIX AS A POSSIBLE CAUSATIVE FACTOR IN GANGRENOUS APPENDICITIS

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THE classification of acute appendicitis into purulent and obstructive types is, I believe, now generally accepted. Very little has been done toward explaining the purulent type, except for the fact that it often occurs during acute respiratory infections. However, numerous theories have been advanced to explain the obstructive type. Wangensteen and Bowers are of the opinion that an increase of intraluminary pressure is of paramount importance in obstructive appendicitis. They found in animals that intra-appendiceal pressure of from 6 to 15 cm. of water maintained for six to eighteen hours caused inflammation of the appendiceal wall. In man, fecaliths or other mechanisms cause occlusion, and after a few hours there occurs a denudation of the mucosa, permitting organisms to penetrate to the submucosa. Bowers has emphasized the fact that most of the appendiceal blood vessels are located in this layer, and infection here is very prone to cause thrombosis and gangrene.

Tennison and Dixon state that in 24 per cent of obstructive appendicitis in their series of 197 cases fecaliths were found, and might be the causative factor; another 25 per cent, might be due to adhesions, constricting bands, etc. Wax and Cooper even mention oxyuris infestation as a cause. This leaves about 50 per cent of the cases in which the gangrenous condition must remain unexplained.

Two years ago a volvulus of the terminal ileum, cecum and appendix was found in a child at operation. When the volvulus was reduced, it was noted that the appendix remained twisted, and presented the gross appearance of an early gangrenous appendicitis. The appendix was removed, and the patient made a good recovery. While reviewing this case, it was remembered that several acute appendices presenting a similar torsion had been observed before, but no particular attention had been paid them. Could it not be possible that this torsion or volvulus of the appendix might be a causative factor in producing acute obstructive appendicitis? Since then every effort has been made to visualize the appendix in situ whenever possible, and a series of fifty-seven cases of torsion has been collected. Several surgeons have been consulted, and they all recall similar conditions, but had paid scant attention to them, being more interested in the degree of inflammation present, and in the mechanics of the operation. A rather cursory examination of the

literature failed to show a description of this condition, although Wilkie of Edinburgh mentions a band from the tip of the appendix to the head of the cecum which will produce obstruction of the appendiceal lumen, causing an acute attack of appendicitis. So far this condition has not been noted in this series. Spinal anesthesia was used in all of these cases, and it was found that by pushing the cecum gently upward with the left index finger, about one third of all appendices could be visualized in situ. The fifty-seven cases with torsion listed, represent about 30 per cent of appendices visualized. All retrocecal appendices and those that had to be delivered or manipulated to be visualized, were not included.

The first eleven cases were merely recorded as torsion of the appendix. Since then further points have been noted, and a more constant yardstick found with which to classify the cases. Forty-one of the last forty-six cases were rotated counter clockwise, and only five clockwise. Seventeen cases had one or more fecaliths, which is a slightly higher percentage than found by Tennison and Dixon. Twenty-one cases had less than one full turn—approximately a half turn—and they are called type 1; sixteen appendices were rotated a full turn—type 2; and nine were rotated two or more turns, resembling a watch spring or conch shell. These were called type 3. The cases varied from very early involvement to advanced gangrene, but only one perforation was noted. This was probably due to the fact that most perforated cases could not be visualized due to adhesions, and were therefore not included in these series.

Seventeen cases showed distinct evidence of pressure by the meso-appendix as it crossed over the base of the appendix. Thirteen of these seventeen were of type 2; four of type 1; and none of type 3. These seventeen cases were all fairly well advanced, the appendix varying in color from dark purple to greenish gray; and the meso-appendix showed evidence of thrombosis and gangrene. All these signs were distal to, and stopped abruptly at the point where the meso-appendix crossed the base of the appendix, although other signs of inflammation, such as petechia and edema, persisted to the cecum itself.

Type 3 presented several peculiarities of its own. It was found that, while all the cases had a rather short meso-appendix, type 3 showed an unusually short one, and in addition it was found that the meso-appendix contained very little fat. Of the five cases rotated clockwise, four were of type 3, one of type 1, and none of type 2. It was also noted that in no cases of type 3 was there evidence of pressure at the base of the appendix. In fact the appendix

was coiled around the meso-appendix, which in turn was twisted like a rope, occluding the circulation in the blood vessels; several cases showing thrombosis. While the appendix in these nine cases was invariably swollen and edematous, in no case was there evidence of fecaliths or other obstruction to the appendiceal lumen, other than torsion of the appendix itself. All fifty-seven cases in the series were of the gangrenous type; none of the suppurative.

All this leaves a lot of unanswered questions. For instance: Does torsion or volvulus of the appendix cause gangrene or do gangrenous appendices tend to rotate? If torsion causes gangrene, what per cent of retrocecal and other non-visualized appendices are caused by it? Do fecaliths cause torsion, or does torsion of the appendix lead to the formation of fecaliths? Why were forty-one cases rotated counter clockwise and only five clockwise?

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WAR TIME MEDICINE

Since that fateful Sunday afternoon, December 7, it has been hard to think of anything but War. It is futile now to lament those things that we have left undone that we ought to have done. Rather let us rejoice that the cheap veneer of cynicism that has blemished our country for two decades was effectively destroyed in the attack on Pearl Harbor and that a thoroughly united country is now buckling down to the one job that really matters.

Winning this War is going to be quite a job. In it no group will bear heavier duties and responsibilities than the medical profession: no group will shoulder those burdens with more cheerful patriotism.

Newspaper polls for months have indicated that the South was the most belligerent part of the United States. Southerners indeed have never been addicted to pacifism or appeasement: we have never hesitated to fight in a good cause, and many of us have long felt that the utter defeat of Germany and her cohorts was such a cause. In response to the questionnaire sent out in 1940 by the American Medical Association, Dr. J. E. Paullin tells us that 65 per cent of the doctors in the Fourth Corps Area (which covers most of the territory represented in The Southeastern Surgical Congress) have promised that they would volunteer their services in the event the United States became involved in war. Sixty-five per cent! Needless to say, two doctors out of three in this part of the country cannot be permitted to don the uniform.

Those who are lucky will be allowed to enter the military services and they will have to learn the latest in military medicine, and they will have their hands full before the War is won.

However brave our soldiers and sailors, aviators and marines, they cannot win this War until America is outstripping the Axis in

producing the sinews of war. Our factories must not only make up for the start they have on us, but they must also turn out munitions, planes, tanks and ships to supply America, England, the Netherlands, China, Russia and those countries now in eclipse. To effect this, our workmen must be kept in the pink by means of better medical care than they have ever had before. Industrial medicine will assume a greater importance than ever.

The most important thing for the doctor to do now is to determine where he can serve his country most efficiently. The medical profession has been on the alert: the headquarters of our national organization has already on file every doctor's qualifications and special interests: it also knows much about the needs of the community in which he is now practicing. Legal compulsion will not prove necessary. Many doctors, regardless of their wishes in the matter, will have to stay at home. The fighting man will not be able to do his best if he fear his wife and family are lacking necessary medical attention. The average doctor who stays at home will have to work harder than ever—and for less pay, and he will have to study to anticipate epidemics and other exigencies. It is possible that some civilians may even need military surgery. And while we are about it, it is vital that the undergraduate students of medicine understand that they can serve best by staying put and studying hard.

The doctors of America will do their best and that best will be good enough.

ON ACTIVE MILITARY DUTY

In the Roster of The Southeastern Surgical Congress it will be noted that twenty-six men are on active military duty: exactly half of those listed are from Georgia. It is not unnatural that we know more about our own personal friends who are in uniform. We have no record of men on active military duty from several States nor from the great State of Texas. We are quite sure that many we have not heard from are in the Army, Navy or Marine Corps. Aside from the matter of the record, Fellows who are with the armed forces of the United States can receive THE SOUTHERN SURGEON for the duration of the War. We therefore again earnestly request that each Fellow on entering the service notify this office and each reader who knows of Fellows in the Service who are not so listed in the Rosters will send promptly to the Editor of THE SOUTHERN SURGEON, 104 Ponce de Leon Ave., N. E., Atlanta, the name, military rank, date of entering the service, and station.

BRONCHIOGENIC CARCINOMA

The frequent occurrence of bronchiogenic carcinoma, its utter hopelessness unless treated early by radical surgery, and the advanced stage in which it is usually being diagnosed suggest a recapitulation of some of the more important features of the disease.

There is now general agreement that all primary carcinomas of the lung, including most, or all, superior sulcus or "Pancoast" tumors, are bronchiogenic. Present tendency is to classify these tumors pathologically in three groups, squamous cell (epidermoid) carcinoma, adenocarcinoma, and undifferentiated (basal cell, oat cell, reserve cell, anaplastic) carcinoma. The type of tumor has some prognostic significance, squamous cell tumors tending to spread least rapidly and the undifferentiated type most rapidly. These tumors may arise in a large bronchus in close proximity to the hilum or, less commonly, in a small bronchus nearer the periphery. Carcinoma arising in the trachea is very rare.

The long controversy as to whether the increased incidence, as reflected in clinical and autopsy reports and vital statistics, is apparent or real has led to the conclusion that it is both apparent and real. Between 1 and 2 per cent of all autopsies and between 6 and 15 per cent of autopsies on patients dying of cancer reveal bronchiogenic carcinoma. Attempts to correlate the real increase with chronic respiratory irritants such as tobacco smoke, exhaust fumes from gasoline engines, and tar from roads, and with squamous metaplasia of bronchial epithelium associated with influenza have been unconvincing. One cannot escape being impressed by the high incidence of bronchiogenic carcinoma reported among the Schneeberg miners in Saxony (exposed to dust containing bismuth, cobalt, and arsenic) and the workers in the radium mines of Jochymov, Czechoslovakia, but pneumonoconiosis, per se, has not been incriminated. Chronic pulmonary and bronchial suppuration has not seemed to encourage carcinogenesis. On the other hand, the proposed antagonism between pulmonary tuberculosis and bronchial cancer has not been upheld.

The preponderance of males over females is well known, as is the usual occurrence after the age of 40. However, there have been enough cases occurring even under 20 to make age of little diagnostic significance in the individual case. Location is of no help in diagnosis but, from the standpoint of operability and prognosis, the right upper lobe is distinctly unfavorable.

In 1933, Carlson and Ballon[1] listed the following methods of diagnosis:

1. Clinical history.
2. Physical findings.
3. Fluoroscopy.
4. Roentgenography.
5. Bronchography.
6. Bronchoscopy.
7. Biopsy or aspiration of tumor.
8. Diagnostic pneumothorax.
9. Examination of pleural fluid or sputum.
10. Thoracoscopy.
11. Exploratory thoracotomy.

This list remains unchanged although there have been shiftings of emphasis and increase in skill of application and interpretation. It must be stressed that diagnosis is incomplete until the operability or inoperability of the lesion is determined.

The most distressing feature of the disease is that initial, impressive symptoms are apt to be evidence of advanced disease. Too often, symptoms referable to the brain or spinal cord, pain from skeletal metastases, pleural effusion, loss of voice, or digestive complaints first send the patient to the physician. It is the same with dysphagia, Horner's syndrome, or obstruction of the superior vena cava, telling at once that the mediastinum is already invaded. Dyspnea, due to one or more of several mechanisms, may announce the disease and the doom of the patient. Metastasis to liver, kidneys, or adrenals, while as frequent as that to the skeletal and central nervous systems, is less apt to give rise to initial symptoms.

A little less ominous is the onset with symptoms due to infection distal to bronchial obstruction. Many patients date their illness from a "chest cold" or "influenza" or "pneumonia" which has failed to clear up completely. Bronchiogenic carcinoma underlying the appearance of lung abscess and bronchiectasis in adults has been so frequent as to lead to the dictum that a diagnosis of either is incomplete without a bronchoscopic examination. Extension of such infection through the pleura may lead to empyema and confuse the picture completely.

Symptoms which are more helpful in leading to the discovery of operable disease are persistent cough, intermittent or persistent wheezing, and bloody sputum. Any cough lasting more than two weeks or any "asthma" of late onset calls for investigation. Sputum is usually small in amount unless infection has supervened. The peculiar syndrome of the superior sulcus or "Pancoast" variety of bronchiogenic carcinoma is well known, with its direct involvement of the brachial plexus, upper ribs, spine, and contiguous great vessels; general paucity of pulmonary symptoms; and tendency to early

central nervous system metastasis. Without serious infection, loss of weight, anemia, and other constitutional phenomena so often attributed to cancer, are minimal until the disease is far advanced.

The abnormal physical signs, if any, merely reflect the underlying anatomic conditions. They are grouped about partial bronchial obstruction; complete bronchial obstruction; pneumonitis or suppuration; mediastinal, pleural, or chest wall extension or metastasis; and distant metastasis. Routine laboratory examinations are of no help.

Fluoroscopic examination is essential for determining mobility of the diaphragm and is helpful in detecting pulsation and in planning the most advantageous projections for x-ray films. Observation of swallowed barium has a considerable usefulness in differential diagnosis.

Roentgenography is, of course, of utmost importance. The secondary effects of bronchial obstruction and pleural and mediastinal involvement are often more prominent than the shadow of the primary tumor. In the presence of pleural fluid, aspiration with or without replacement of air will often produce more informative films. The use of tomography makes possible demonstration of some lesions obscured even to the Potter-Bucky technic by massive atelectasis or extensive pleural or pulmonary inflammatory change. The greatest dangers of overlooking bronchiogenic carcinoma in x-ray studies are (1) being persuaded of a purely inflammatory origin of shadows produced by a combination of bronchial obstruction and infection and (2) failure to utilize lateral films regularly to demonstrate areas obscured by heart and diaphragm in the usual postero-anterior film. After the discovery of an x-ray shadow suggestive of tumor, there is a tendency to wait for a period of several weeks, restudy the chest, and draw conclusions from the presence or absence of change. Time is too precious and evidence of growth too uncertain to warrant such a course without employing all other available aids to diagnosis. The primary tumor may remain relatively small and inconspicuous while metastases are destroying the patient.

Gebauer[2] has recently presented evidence of correlation between histologic type, visibility and appearance on bronchoscopic examination, and x-ray manifestations of bronchiogenic carcinoma. While of great interest, this correlation is not reliable enough to be of much help clinically.

It is said that about 75 per cent of bronchiogenic carcinomas can be seen through the bronchoscope when first discovered by x-ray

examination but that probably only 40-50 per cent can be seen at the time of earliest appearance of symptoms. When the primary tumor or its upward extension along the bronchial mucosa can be seen through the bronchoscope, a positive biopsy can almost always be safely obtained, although several attempts may be necessary in the presence of considerable infection. The bronchoscopic findings are often surprisingly extensive in view of the x-ray and clinical findings. Regardless of the location of the tumor in the chest, bronchoscopy is indicated unless (1) the tumor already presents conclusive x-ray or clinical evidence of inoperability and (2) a pathologic diagnosis can be more easily made by biopsy of a cervical node or other accessible metastasis or by aspiration biopsy of the primary tumor. Bronchoscopy not only affords the best method of making a positive diagnosis but it is an indispensable step in the determination of operability in doubtful lesions. If the tumor has extended too far up one of the main bronchi for technically safe, complete excision or if there is widening and fixation of the normally sharp and flexible carina, it is inoperable. A negative bronchoscopy does not rule out bronchiogenic carcinoma and a demonstrable x-ray shadow is not necessary to justify bronchoscopy.

While there is extensive reference in the literature to the bronchographic findings in bronchiogenic carcinoma, the reliable diagnostic information which it can add to bronchoscopic and ordinary x-ray examinations is distinctly limited.

Bronchoscopic biopsy has been discussed. In inoperable tumors, a metastatic cervical node or, rarely, an axillary node or skin nodule may be available. Stained sections of the fixed sediment from aspirated pleural fluid will frequently make the diagnosis. Aspiration of tissue through the chest wall is, in some inoperable cases, a satisfactory diagnostic measure. Churchill's[3] advice is to explore the chest on a presumptive diagnosis of operable bronchiogenic carcinoma rather than risk disseminating the tumor with the needle to establish the diagnosis preoperatively. There are insufficient data at present to settle the delayed danger of needle biopsy. Examination of the sputum for tumor cells has been helpful in some hands but is of doubtful value in most laboratories.

Diagnostic pneumothorax is occasionally useful in differentiating between a mediastinal tumor and a tumor in the lung which is inaccessible to the bronchoscope. It will give some information as to the presence and location of adhesions but is not justified on this basis. It is, of course, a necessary preliminary if thoracoscopic examination of the pleura is thought necessary but there seems to

be more tendency, at present, to rely upon the presence or absence of pleural effusion for evidence of pleural involvement.

Exploratory thoracotomy is still the court of last resort. With suspected bronchial carcinoma which cannot be safely proved otherwise and which is not obviously inoperable, it should be undertaken with no more hesitation than exploration of the abdomen for suspected gastric cancer. Only with the chest open can the final decision be made as to whether all grossly involved tissue can be removed.

Present treatment is limited to surgery and irradiation. Without entering into the conflicting evidence as to whether or not x-ray therapy prolongs life by a few months, one must say that it is only palliative at best, sometimes relieving the pain of metastases and reducing bronchial obstruction. The real surgical attack began in 1933 with Graham's[4] first successful pneumonectomy for bronchial carcinoma, although earlier in the same year Carlson and Ballon[1] had been able to collect thirty-five previous operations of various sorts aimed at resection or destruction of the tumor. Nissen[5] had performed the first successful pneumonectomy in 1931 and Haight,[6] the second, in 1932, but both were for bronchiectasis.

The figures compiled in 1939 by Ochsner and DeBakey[7] covering the entire history of pneumonectomy for tumors are, of course, discouraging. Of 86 cases, including 7 of their own, 55 (64 per cent) died and 31 (36 per cent) recovered. Of the 31 recovering from operation, 5 were known to have died later of metastases or other causes. Eighty-nine and three-tenths per cent of these pneumonectomies had been done for primary bronchiogenic carcinoma. On the other extreme are such reports as Rienhoff's, also in 1939, of 20 cases subjected to pneumonectomy by him with a particular technic. Of these, only 2 (10 per cent) died after operation. Graham's first case was still alive and well at least 7 years after operation and the group of 5 year survivals is steadily growing.

While many technical points are still under discussion, the modern operation implies the complete removal of the lung and its adjacent nodes with individual ligation of vessels, suture of the bronchial stump, and closure of the chest without drainage. Cyclopropane and ether are the most favored anesthetic agents, administered through a closed system with provision for positive pressures and aspiration of the tracheobronchial tree. An intratracheal tube is usually favored, particularly if there is much sputum. Questions having to do with preoperative use of pneumothorax, postoperative thoracoplasty, division of operation into stages, and effect of sul-

fonamides on postoperative infection require more data for satisfactory settlement.

The chief causes of operative deaths have been (1) infection, (2) cardiac failure, (3) primary hemorrhage, and (4) late hemorrhage secondary to infection.

The contraindications to exploration are many and they are based upon the belief that there is no justification for any palliative lung resection for carcinoma. There must be reasonable hope that tumor bearing tissue will be completely extirpated. The contraindications fall into two groups:

1. There must be no evidence of extension or metastases beyond limits of pneumonectomy.

A. Bronchoscopic evidence of extension too high for complete removal and successful closure.

B. Mediastinal invasion.

i. A paralyzed diaphragm (phrenic nerve involvement).

ii. A paralyzed vocal cord (recurrent laryngeal involvement, more frequent on left).

iii. Horner's syndrome.

iv. Obstruction of the superior vena cava.

v. Dyspnea due to mediastinal pressure.

vi. Severe pain.

vii. Dysphagia.

viii. X-ray evidence of involvement of peribronchial and peritracheal lymph nodes in the absence of the clinical symptoms mentioned.

ix. Bronchoscopic evidence of involvement of nodes at the bifurcation of the trachea.

C. Pleural effusion (whether bloody or not and whether malignant cells are demonstrable or not).

D. Direct extension to chest wall, spine, brachial plexus (as in superior sulcus tumors).

E. Distant metastases—the most likely discoverable sites are

i. Cervical nodes and, rarely, axillary and other peripheral nodes.

ii. Brain, spinal cord, and meninges.

iii. Skeleton, particularly spine (any pain or tenderness or percussion must be investigated).

iv. Liver (an enlarged liver, whether nodular or not, is presumptive evidence).

2. There must be no constitutional factors which make the patient an unjustifiable risk for major surgery. Careful consideration of age (chronologic and physiologic) and general condition, together with any coexistent disease, should lead to the conclusion that (1) the patient would have a reasonable life expectancy in comfort

were it not for the bronchiogenic carcinoma and (2) he would have a reasonable chance of surviving an operation throwing a considerable burden upon the cardiorespiratory systems. Without surgery, the disease is fatal within an average period of less than one year after diagnosis. Grave operative risks are warranted.

When the chest is explored, pneumonectomy is proceeded with if there is no gross evidence that the tumor cannot be completely removed. Even a portion of the pericardium, if involved by direct extension, may be removed with the lung.[8]

It has been demonstrated many times that the absence of one lung is entirely compatible with a life of comfort and of normal activity short of the more strenuous sports and types of labor.

While it was stated in a previous paragraph that "initial, impressive symptoms are apt to be evidence of advanced disease," studies of large groups of cases suggest that many of these patients had initial, unimpressive symptoms when the tumor was still operable. When any cough which doesn't clear promptly, any wheeze, any blood streaked sputum, any attack of "influenza" or "pneumonia" which leaves the patient under par and with persistent signs leads to prompt and thorough investigation of the chest, many more of the victims of this insidious attacker will reach the surgeon in time. On the other hand, the surgeon is constantly increasing the safety of the radical operation which he has to offer.

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BOOK REVIEWS

The Editors of THE SOUTHERN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The Editors do not, however, agree to review all books that have been submitted without solicitation.*

THE DOCTORS MAYO. By HELEN CLAPESATTLE. 822 pages. Illustrated. Price, $3.75. Minneapolis: The University of Minnesota Press, 1941.

Though every town boasts of at least one surgeon considered wonderful by his fellow citizens—and we are not intimating that there are not good surgeons in most of them—there is only one name in American surgery whose fame has gone round the world, that is known not only to every doctor in the country but also to almost everyone else. The success of these two small town boys who practiced all their lives at home is a story to thrill Americans. Horatio Alger never wrote anything to compare with it.

This volume opens with what is known of the ancestry and early life of William Worrall Mayo. Born in 1819 near Manchester, England, he migrated to this country at twenty-five years of age. The book outlines his various early attempts to make a living, his medical education, his wanderings and adventures on the frontier. The wisest and best thing he did in his early life was to marry Louise Abigail Wright. Mrs. Mayo must have been a truly remarkable person: the bravery and toughness of a pioneer woman, the wisdom, tolerance and understanding of a great lady, the common sense and business acumen of a successful American (one gathers that her millinery shop often provided the principal source of the family's income),—such qualities must have been powerful factors in making her sons what they became; especially she must have endowed them with steadiness. One may well wish that there was more written about her.

Dr. W. W. Mayo remains a paradox. He must have been a good surgeon for his day and time. Certainly he traveled considerably to improve himself; he raised his sons in medicine, and instilled into them insatiable ambition and unlimited capacity for hard work. Certainly too, his famous sons revered his memory and often quoted principles he had made part of the fiber of their being. And yet, with his mercurial temperament he was an irascible eccentric: it would appear that the author had tried almost too hard to slick up his portrait.

William James Mayo was born near Rochester in 1861 and Charles Horace Mayo entered the world almost at the site of the fountain in the reception room of the first six story Clinic building. The amount of material unearthed about their early life is amazing. All of this is most interesting in spite of the fact that painstaking research has established that they were a bit older at the time of certain events than they themselves had thought sixty years later. But it is hard to imagine Dr. Will ever leaping the horizontal bar and turning handsprings!

It is not appropriate to attempt here to outline the rise to eminence of the Mayo brothers. Doctors are more or less familiar with their lives. In this work they will find an authoritative account. They will find also the story of the development of modern surgery: Listerian technic was just being introduced into this country at the time Will Mayo was graduated. It should be noted that the author makes no unwarranted claims for original technics devised by the Mayos. She gives them just credit for evolving and perfecting the modern clinic and for their contributions to medical education. The drama of their lives could not have been made uninteresting.

Dr. Will was the one man in the world that this reviewer was afraid of, although he entertained infinite respectful admiration for him. Dr. Charlie he loved: who ever shook Dr. Charlie's hand that did not love him? Personally therefore, he would have preferred to have had less emphasis on Dr. Will and more detailed stories about Dr. Charlie. His first impression was that his other idol, Henry Plummer, was somewhat slighted, but he has realized that after all it is a life of the Doctors Mayo.

The chief virtue of this book is that it does a plain unvarnished tale deliver: one may be sure that it is completely authentic (if uninspired) and doctors, in view of their training in the search of scientific truth, should perhaps treasure it the more for that. To revert once more to the personal however, this reviewer would have preferred a little more varnishing.

OCCUPATIONAL DISEASES: DIAGNOSIS, MEDICOLEGAL ASPECTS AND TREATMENT. By RUTHERFORD T. JOHNSTONE, A.B., M.D., Director of the Department of Occupational Diseases, Golden State Hospital, Los Angeles, California; Formerly Assistant Professor of Medicine, University of Pittsburgh School of Medicine. 558 pages, with 132 illustrations. Price, $7.50. Philadelphia & London: W. B. Saunders Company, 1941.

This book is important.

The original Workmen's Compensation Acts applied only to accidents on the job and excluded disability not traumatic in origin. For that reason "industrial medicine" was largely done by a few surgeons employed by large industries. Year by year various States have amended the laws to include at least specified diseases of occupation. Before long probably all States will have similar provisions. Following such enactments, the medical responsibility shifts from a few surgeons to all physicians in every community.

This book is designed to outline a basis for diagnosis and treatment of the more common occupational diseases, to interpret the medicolegal phase, and to offer from experience the expected disability. The author expressly disclaims to be a scientific investigator or a toxicologist: he is a practitioner in the field of occupational diseases. These very facts add to the value of the book. At the same time, he has added to his own wide experience extensive research in literature not readily available.

The primary duty of the industrial surgeon is to restore the disabled man to good health and normal activity whenever possible. Yet when a workman's disability is in no way connected with his job, it is not fair to his employers (or the insurance company) to make them pay for it. The role of the doctor is to establish the truth; in case of doubt he should give the workman the benefit of the doubt. It is interesting to note that Dr. Johnstone believes nearly all men prefer to be rehabilitated as far as possible rather than to receive pay for disability. He has seen relatively few malingerers.

Each chapter is good: that on carbon monoxide is perhaps of greatest importance to most of us. In the section devoted to hernia one is glad to note that his ideas are in perfect accord with the editorial in the December number of the SURGEON.

This book, as we have said, is important. It is indispensable to the man engaged in industrial medicine. It contains much of value to every physician and it is good reading for any one interested in matters medical.

X-RAY THERAPY OF CHRONIC ARTHRITIS (Including the X-Ray Diagnosis of the disease). Preliminary report based on 100 patients treated at Quincy, Illinois. By KARL GOLDHAMER, M. D., Associate Roentgenologist, St. Mary's Hospital and Quincy X-Ray and Radium Laboratories; Formerly Roentgenologist, University of Vienna; Honorary Member, Mississippi Valley Medical Society, etc. With a Foreword by HAROLD SWANBERG, B. S., M. D., F. A. C. P., etc. 132 pages, with 24 original illustrations by the author, 2 roentgenograms, and 4 tables. Quincy, Illinois: 1941. Radiologic Review Publishing Co.

This little book is based not only on the author's observations of patients he has treated since being in this country, but also on the observation of hundreds of patients treated by him during his fifteen years' practice in Vienna.

There are chapters on the roentgenologic differential diagnosis of arthritides in general, on the history of x-ray therapy of chronic arthritis, on the action of x-rays in the treatment of arthritis, and on the indications and contraindications for this particular type of therapy. In the technic of treatment the following factors are considered: "(1) general condition of the patient, (2) type of arthritis, (3) place of application, (4) stage of the disease, (5) localization of arthritis, (6) position of the x-ray tube, (7) x-ray dose and (8) intervals."

On the basis of observations made upon *one hundred* patients, the author concludes: "Twenty-seven and nine-tenths per cent of our patients may be considered as clinically cured; considerable improvement was obtained in 30.8 per cent; in 28 8 per cent, only a slight improvement could be obtained and 12.5 per cent proved failures."

The main fault to be found in the author's presentation of the hundred cases lies in the lack of, or failure to mention, control measures. There is no mention made of comparison of results using this technic with other technics. There is inadequate exposition of the general therapeutic measures adopted.

A MANUAL OF THE TREATMENT OF FRACTURES. By JOHN A. CALDWELL, M.D., Professor of Clinical Surgery, College of Medicine, University of Cincinnati; Director of the Fracture Service, Cincinnati General Hospital, Cincinnati. 150 pages, with 76 illustrations. Price, $3.50. Springfield: Charles C Thomas, Publisher, 1941.

This handbook is not offered as a substitute for the standard texts on fractures nor to describe specific methods, but rather to elucidate principles of procedure, to try to rationalize what is considered good practice, and to point out the errors in poor management. It is well worth while.

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Dr. Elisha Barksdale.....Allied Arts Building, Lynchburg
Dr. R. P. Bell.....211 West Frederick St., Staunton
Dr. P. W. Boyd.....212 West Boscawen St., Winchester
Dr. W. R. Bracey.....118 East Franklin St., Richmond
Dr. C. C. Coleman.....1200 East Broad St., Richmond
Dr. J. D. Collins.....Medical Arts Building, Portsmouth
Dr. F. R. Crawford.....Dorothy May Building, Farmville
Dr. D. S. Daniel.....Johnston-Willis Hospital, Richmond
Dr. Paul Davis.....Lewis-Gale Hospital, Roanoke
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Dr. M. A. Johnson, Jr.....Lewis-Gale Hospital, Roanoke
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